An Integrated Learning Approach to Teaching an Undergraduate Information Systems Course

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ABSTRACT

This paper describes the redesign and implementation of an introductory Information Systems class. The redesign was guided by principles drawn from the experiential and active learning literature. Central to the redesign are two simulated companies: petGRO, a fictional ERP-enabled pet food and accessories e-tailer, and beans4all, a technology consulting company of which all registered students are employees. Students work in solution crews throughout the semester to solve a set of technology-related challenges that their client, petGRO, is facing. Initial student response to the redesign has been mixed. Survey responses indicate that students have an increased interest in IS after taking the course. There was a significant increase in students' perception of the usefulness of the knowledge gained from the course in subsequent courses. However, this result is countered by a decrease in students' perception of whether the course led to an improvement in their academic skills. Open-ended comments reveal the polarizing nature of the redesign but with more positive than negative comments.

Keywords: Introductory course, Active learning, Experiential learning & education, Simulation, Role-play

1. INTRODUCTION

We teach a required Introduction to Information Systems (IIS) course at the second-year (sophomore) level in a Commerce program at a mid-sized, Canadian university. We struggle to motivate students in a core course for which most have little intrinsic interest. Over the last three years, nearly 70% of the incoming students to our Bachelor of Commerce program have declared a major before taking any university class and of those 70%, only 1.8% have chosen Information Systems (IS) (Office of Institutional Research & Planning, 2017). Enrolment in our IS concentration declined steeply after the technology bubble burst around 2000 and has been relatively flat since 2004 (Office of Institutional Research & Planning, 2016). In addition, IS remains one of our lowest subscribed concentrations. It has been reported that students perceive IS as analogous to computer science and that their low self-efficacy in programming skills significantly impacts their attitude towards pursuing an IS career (Joshi and Kuhn, 2011). Students' belief that there is almost no human interaction in the IS profession has been identified as the most important factor in discouraging IS enrollment (Chipidza, Green, and Riemenschneider, 2016). Thus, most students enter our classrooms with a declared major in another area, feeling that IS only focuses on technical skills they do not possess, and with a profound misunderstanding of what an IS career entails.

Against this backdrop, we embarked on a radical restructuring of the classroom experience. Informed by both the active learning and experiential learning literature (Lewis and Williams, 1994; Lord et al., 2012; Mitchell, Petter, and Harris, 2017; Prince, 2004) we have designed and implemented a unique, customized IIS pedagogical vehicle that has demonstrated some initially positive, if somewhat contradictory, results. Guiding our course redesign were three interrelated target outcomes. We sought to provide:

1. an engaging and stimulating environment to increase interest in IS
2. skills for academic success
3. skills for employment success

The first is an overarching objective subsuming the other two. That is, in attempting to provide skills for academic and employment success, we designed course activities and deliverables in the context of an engaging and stimulating environment. The second outcome stems from internal AACSB accreditation course mapping work which acknowledges the role of the IIS course in providing certain knowledge and skills to support success in other academic work. The third outcome address feedback the school's career management centre receives from potential employers who seek to hire students who can analyze problems quickly, provide potential avenues for solutions, and who can communicate proposed solutions in a clear and concise way (Allen, 2016). These outcomes are mimicked in the literature where it has been stated that both educators and employers are aware of the need for problem solving and decision making skills among workforce recruits (Hamilton and Kleba, 2011). To facilitate these outcomes, we have incorporated aspects of both experiential and active learning into our IIS classroom environment.

Students expect more and more from their education (Auster and Wylie, 2006), and expect it to be as engaging as would be the many other uses to which they might dedicate their time. Higher education, and especially those delivering it on the front lines, must continually adapt or risk marginalization. Adaptation strategies include the increasing use of experiential and active learning. Clark and White (2010) pointedly issue the dictum that "A quality university business education program must include an experiential learning component" (p. 115). By their nature, experiential and active learning necessitate higher engagement than does passive learning. In addition, both have been shown to foster critical thinking (see Hamilton and Kleba, 2011) and, through intentional activities, communication skills are likely improved through regular practice.

While much of the experiential and active learning initiatives evolved in engineering and science disciplines, more recent literature has identified that the traditional, lecture-based approach is not effective for teaching IIS and that students should be doing more than 'just listening' in the classroom (Gudigantala, 2013). This assertion is supported by IS educators as evidenced by the variety of active learning techniques that have been successfully adopted in IS classes as reviewed by Mitchell, Petter, and Harris (2017). However, except for Gudigantala (2013) and Drake (2012), we are unaware of any comprehensive active learning implementations or evaluation frameworks for the IIS course.

Our purpose is to report on the recent implementation of a redesigned IIS course focusing on experiential and active learning. At the heart of the redesign are semester-long, role-playing activities where students become virtual employees of a fictional technology consultancy called beans4all which provides IT-based solutions to their client, petGRO (a pet food and accessory manufacturer and e-tailer). This immersive, customized, role-playing approach is novel, and to our knowledge, unique among IIS courses. We fully describe this initiative, provide some initial results, and hopefully contribute to the growing body of research on the use of experiential and active learning in the IIS classroom. Additionally, we aim to provide the readership with a sufficiently detailed description of our course to allow adoption of all or some of the elements into their own curriculum.

This paper is organized as follows: we first present background on engagement, experiential learning, and active learning. We follow with a thorough description of our revised IIS offering. We then report on results generated from student surveys. Following a brief discussion, we conclude with a summary and proposed future work.

2. BACKGROUND AND RELATED RESEARCH

Student engagement is identified as a critical component of achieving positive learning outcomes (Krause and Coats, 2008). While the construct of engagement is multi-dimensional (Fredricks, Blumenfeld, and Paris, 2004) and difficult to assess, it remains central to several pedagogical approaches including experiential and active learning. We briefly introduce engagement and then discuss both experiential and active learning as foundation and guidance for our IIS course redesign.

2.1 Engagement

> *Student engagement is concerned with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimise the student experience and enhance the learning outcomes and development of students and the performance and reputation of the institution.* (Trowler, 2010, p. 3)

The three primary components of student engagement are emotional, behavioral, and cognitive reactions to educational activities (Fredricks, Blumenfeld, and Paris, 2004; Goldspink and Foster, 2013; Gunac and Kuzu, 2015). Emotional engagement includes feelings, attitudes, and relationship to and with instructors, fellow students, course content, and course structure. It has been operationalized as test anxiety in a number of models that include student engagement (McKeachie et al., 1986; Syler and Baker, 2016). While most aspects of emotional engagement are difficult to assess, behavioural engagement involves more concrete concepts such as student effort, proactive participation, and attendance. As such, measures of behavioural engagement are more common in application and study. Models assessing student performance have proposed that student engagement mediates the relationship between the instructional approaches used in the classroom and student outcomes, and more specifically that instructional methods impact the behavioral, affective, and cognitive engagement factors (Syler and Baker, 2016; McKeachie et al., 1986). Achieving engagement outcomes in the classroom can thus be enabled in many ways as proposed in both the experiential and active learning literature.

We refer to engagement within experiential and active learning activities as 'engagement by design.' That is, designed activities that 'force' behavioral engagement are fundamental to experiential and active learning approaches. Proponents of this type of learning share the perspective that students need to be actively engaged (Sarason and Banbury, 2004), should be solving problems to get deep into higher-order thinking (Bonwell and Eison, 1991), and that instructors

need to create an environment that is open and relaxed (Auster and Wylie, 2006), thus reducing barriers to emotional engagement.

Active learning has also been shown to improve cognitive outcomes (Michel, Cater, and Varela, 2009), possibly as a result of students' behavioral and emotional engagement. Additionally, as observed by Stolk and Harari (2014), classrooms that engage in active learning practices demand overt cognitive engagement. Such engagement occurs as learners conceptualize problems, set learning goals, draw on existing knowledge, identify and evaluate resources, strategize, monitor and self-regulate, and finally reflect on their approaches.

2.2 Experiential and Active Learning

Experiential and active learning both explore aspects of student involvement and direction in learning outcomes as well as support, in varying degrees, the aforementioned behavioral, emotional, and cognitive aspects of classroom engagement. Lewis and Williams (1994) provide a popular and general definition of experiential learning:

> *In its simplest form, experiential learning means learning from experience or learning by doing. Experiential education first immerses learners in an experience and then encourages reflection about the experience to develop new skills, new attitudes, or new ways of thinking.* (p. 5)

The two main types of experiential learning are: field-based experiences which can include co-operative education, internships, and practicums, among others, and classroom-based learning which broadly can include role-playing, simulations, group work, and presentations (Lewis and Williams, 1994). Our redesign focuses on classroom-based learning and on design elements that are supported by both the experiential and active learning literature. Active learning is anything "course-related that all students in a class session are called upon to do other than simply watching, listening, and taking notes" (Felder and Brent, 2009, p. 2). From our perspective, experiential learning is seen as setting the overall context and structure of the course, while active learning informs the design of actual student activities. This is reflected in Figure 1.

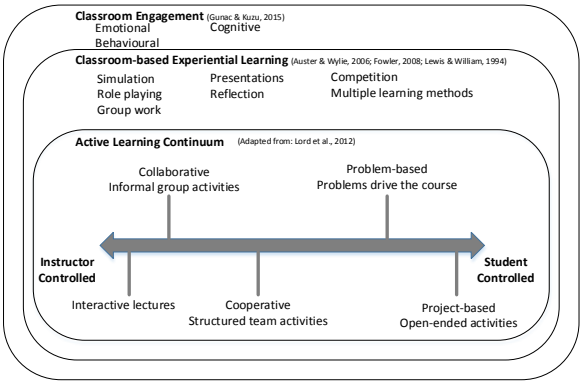

Figure 1. Experiential and Active Learning Activities

2.2.1 Experiential learning: The path from experiential learning to critical thinking and then to engagement is well established. As experiential learning tasks become more complex, detailed, and challenging, higher order and critical thinking emerges (Hamilton and Kleba, 2011). Experiential learning is increasingly recognized as a vital ingredient in university curricula as students rightfully look for an alternative to the one-size-fits-all, three-hour drone of a typical lecture (Hawtrey, 2007). Grounded in the works of Dewey (1938) and Kolb (2005) among others, experiential learning

> …occurs whenever a student is roused from the role of passive listener to that of active respondent… by requiring students to engage first-hand in a proactive manner and asking them, for example, to express opinions, use inductive reasoning, or work in teams. (Hawtrey, 2007, p. 143)

Thus we considered how best to engage our students, to motivate and captivate them, to stimulate their curiosity, and to get them involved in their own learning. We also wanted students to have a greater stake in their own learning and to challenge them to integrate and assimilate the material being presented into actionable information in a process of competitive problem solving. As Hawtrey concludes, "experiential learning makes the student a stakeholder, and that alone significantly improves the ability to absorb knowledge" (2007, p. 145). In addition, we were cognizant of the students' varied learning styles (Kolb, 2005), their need to use various learning methods (Loo, 2002), and the importance of using a diverse set of teaching techniques in an experiential-based curriculum (Auster and Wylie, 2006).

2.2.2 Active learning: As previously stated, active learning is a broad term that encapsulates student activities other than listening and taking notes (Felder and Brent, 2009). There has been much discussion in the literature about the benefits of active learning and in particular its effects on positive learning outcomes. Active learning approaches are claimed to be more effective than traditional "passive" approaches (such as lectures) as active learning requires students to engage and collaborate to co-create the classroom experience. According to Dadach (2013), benefits of active learning include more highly motivated students who are challenged to engage in higher order thinking, such as analysis, synthesis, and evaluation (Bonwell and Eison, 1991). Also, an extensive meta-analysis from Hattie (2008) has provided strong evidence for the positive impacts active learning approaches have on learning outcomes. Our redesign focused on active learning activities.

Embedded inside Figure 1 is an active learning continuum adapted from Lord et al. (2012) who propose that active learning has multiple different approaches that can be operationalized to triangulate student learning opportunities. In a summary article on the effectiveness of active learning approaches, Prince (2004) found support, albeit with different effect sizes, for all the mentioned types of active learning approaches.

At the instructor-led end of the continuum, one can have short activities that can be integrated into a lecture to foster student engagement. These activities can be individual such as

the use of clickers or group based such as pausing lecture and allowing students to clarify notes with another student (Prince, 2004). Both collaborative and cooperative learning involve students working together towards a common goal. The two are differentiated by the method of assessment; cooperative learning typically involves individual assessment while collaborative learning assessment is group based (Prince, 2004).

Problem-based learning involves students working in groups to solve problems that are real-world and often semi- or ill-structured. As such, problem-based learning can be either cooperative or collaborative. Prince and Felder recommend that problems or challenges should be designed to "guide students to use course content and methods, illustrating fundamental principles, concepts, and procedures" with supported facilitation from the instructor (2006, p. 130). In a meta-analysis by Dochy et al. (2003), it was found that problem-based learning has a positive effect on both skill development and knowledge retention. Examples of problem-based learning applied to IS courses include the use of interactive cases (Eierman and Schuldt, 1998) and role-playing activities (Peace, 2011).

Project-based learning involves students working in groups in open-ended assignments that present real-world-like challenges (Prince and Felder, 2006). A literature review by Lord et al. (2012) concluded that problem- and project-based learning are more similar than different and are at times difficult to differentiate. However, Prince and Felder (2006) suggest that project-based learning typically has a broader scope and thus may be less structured and require more student control and initiative than problem-based learning. Mills and Treagust (2003) report that compared to traditional classrooms, engineering students who participated in project-based learning are more motivated, have better communication and teamwork skills, and have an increased understanding of how to apply acquired knowledge to real-world problems.

3. COURSE REDESIGN

Our IIS course is taught in an undergraduate business program in a mid-sized (2015 enrollment approaching 30,000), English-language, research-intensive, Canadian university. Our program offers four-year (honours) degrees in Commerce (BCom) and International Business (BIB) as well as an MBA, an MAcc (Accounting), and a PhD in Management. Undergraduate students can specialize in none, one, or two areas from among eight concentrations in the BCom program (including Information Systems) or five in the BIB program (no IS concentration). The IIS course is a second-year requirement for all undergraduates in both programs, servicing an annual cohort of approximately 600 distributed across 7 sections of roughly 90 students each. The class meets for 12, 3-hour sessions, and online tutorial material is accompanied by multiple-choice quizzes. Teaching material (course syllabi, assignment instructions, slides, and supporting documentation) is provided using a Learning Management System. Senior undergraduate teaching assistants (TAs), resourced at roughly one hour per enrolled student, provide support.

The IIS redesign described in this paper took guidance from both experiential learning and active learning literature and ensured that multiple learning methods were incorporated into the course design. The revamped course is contextualized within a simulated environment; specifically, all students are virtual employees of a fictional technology consultancy called beans4all that has a single client, petGRO. The client is an ERP-supported e-tailer of its own manufactured pet food and third-party pet accessories. Students are provided a ~20 page primer that provides details about petGRO, including: a company overview; history, mission and vision statements; business model descriptions; financials; product descriptions; company and product artwork; information communication technology (ICT) strategy; and functional area demographics. Students are divided into 14 *Solution Crews* from the first class and remain members for the duration. Each crew has a name synonymous with *best* (Apex, Apogee, Supreme, Ultimate, Zenith, etc.). All classroom activities are undertaken within the context of 'students as consultants' (beans4all) providing client solutions (petGRO). Table 1 summarizes and maps the class context and activities into an experiential and active learning matrix. Recall that our operationalization of the learning environment views experiential learning as setting the overall context and structure of the course, while active learning informs the design of the actual student activities.

The weekly class sessions are split into three segments. The first hour is a traditional lecture on information systems followed by two, one-hour *Crew Challenges* (discussed below) wherein an emerging technology is introduced in a short didactic segment followed by a charge to the beans4all solution crews to use that technology to solve, in real time, a carefully-crafted challenge faced by their fictional client, petGRO. Where appropriate, the lecture portion of the class is contextualized for petGRO as a client of beans4all consulting – for example Porter's value chain is explained in the context of petGRO. In support of interactive lectures, clicker questions are posed throughout the lecture hour. Clickers have been identified as an excellent active learning tool and have been shown to increase interactivity with the instructor and thus positively affect engagement (Blasco-Arcas et al., 2013). The clicker questions are based on the previous week's material. After the clicker questions, instructors provide real-time feedback and a quick review of the assessed concept. The lag in review and assessment of the clicker questions is consistent with spacing effect literature which suggests that a memory advantage occurs when the same information is exposed on several occasions (Melton, 1967).

Experiential Learning	Context	**Active Learning**		
		Interactive Lectures	Problem-based Learning	Project-based Learning
Simulation	petGRO / beans4all			
Role-Playing	beans4all Consulting		Crew Challenges Dynamic Excel	Enterprise Evolution Proposal (EEP)
Group Work			Crew Challenges Dynamic Excel	EEP
Presentations			Crew Challenges Dynamic Excel	EEP
Reflection		Clickers		EEP
Competition			Crew Challenges Excellence Scale	

Table 1. Experiential / Active Learning Matrix

An innovative aspect of the course are the crew challenges. These are structured team activities consistent with problem-based learning and occur twice in most weeks. Solution crews work competitively on technology challenges facing petGRO, the now-agile but still-evolving pet products firm. For each crew challenge, seven crews are randomly selected to present their solutions to the *Chief Solutions Provider*, the instructor. Each crew, presenting or not, submits the results of their solution activity for evaluation in the allotted time (ranging from 15 to 20 minutes) using Microsoft's Yammer, a corporate social collaboration tool. The presentations are a role-playing activity and expectations dictate that the students act, engage, and present as would consultants. A primer on crew challenge presentation expectations is provided, and the expectations are continually reinforced via weekly feedback.

The seven randomly selected crews present for two minutes each. The presentations are graded in real time by the instructor (with written feedback provided within a week), while the written material is graded asynchronously by TAs. Based on combining the instructor and TA grades in each group of seven, two are chosen as best, and thus, in keeping with the simulation, their solutions will be provided to the client for consideration. These two receive full (100%) marks, while the remainder is graded relative to these top two with the bottom crew receiving a grade of 33% and the remaining four ranked intermediately. This grading method is referred to as the *Excellence Scale*. The scale can be configured to yield an average grade across a wide spectrum. The formulation of the excellence scale is rooted in the simulation and role-playing aspects of the course; that is, when working within a business environment, competition can be a critical aspect of corporate survival. Additionally, many studies have revealed positive aspects of competition in education (Burguillo, 2010; DeVries and Edwards, 1974; Jameson, 2007; Morin, 2013; Murayama and Elliot, 2012). Findings indicate that competition-based learning techniques can improve motivation to learn the subject material, increase involvement and interest in the classroom, and encourage interactivity amongst students in an effort to do well within the competition (Burguillo, 2010).

Each crew presents a total of 12 times across the term with the first 2 as practice. In any given class, a crew might present once, twice, or not at all. It is not possible to predict with absolute certainty whether or not a crew will be called upon to present their deliberations in any challenge until the end of the penultimate week of class when those crews who have been keeping track can determine where they stand in terms of the 10 graded presentations.

An example crew challenge is provided below wherein we first enumerate the extent of the personal data we all share via various sources of interaction in commerce, employment, browsing, social media, interactions with governmental agencies, and simply from being surveilled as we go about our daily routine. We then discuss the privacy-security tug-of-war and the privacy-utility tug-of-war in terms of a zero-sum game wherein we raise the question "If we want more privacy, and if we want business utility from personal data, must we sacrifice privacy?" The final two slides from the introduction deck are reproduced in Figures 2 and 3, respectively.

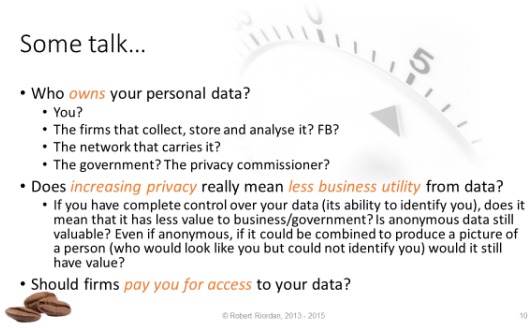

Figure 2. Final Slide in Crew Challenge Preamble

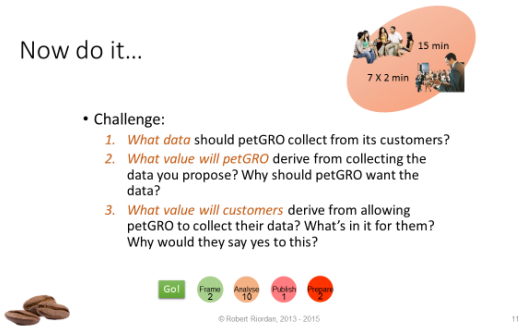

Figure 3. Crew Challenge Problem Questions

Another problem-based learning activity done in crews is the Dynamic Excel assignment wherein all crews are given the same Excel workbook containing simulated multi-year petGRO inventory, sales, returns, and customer service contact figures. Each crew is challenged to make sense of a tranche of the data using Excel PivotTables and charts. Each crew's solution, according to carefully scripted parameters, is presented live in class with the instructor acting as devil's advocate and requiring that real-time changes be made in the pivots to model answers to specific questions that might arise when the crew presents their findings to the management team at petGRO. As with the crew challenges, role-playing is required as the students are presenting as consultants. This assignment requires a fairly nimble instructor, able to assess and play off the answers provided in the real-time environment.

Final exam questions are based equally on textbook material and crew challenges. A further refinement in the course was implemented in the crew challenge segment of the exam. Questions are posed at four different levels. Each of 5 question groupings is graded out of 10 marks. The lowest level within a question group requests a simple list of six things, corresponding to the way in which the classroom crew challenges are architected (a simple list of things, factors, tenets, etc. is part of each lecture). These can simply be regurgitated for six marks on the exam. The catch is that the question is graded out of 10. Thus a student choosing this level of question immediately gives up four marks. The next level up, worth seven marks, asks for a shorter list, but each list item must be accompanied by a brief explanation. However if the student chooses the seven-mark, level two question over the simple, six-mark list variant, they must score at least four in order to receive any marks for their effort.

The final two levels operate in the same way, but up the ante regarding expectation. The level three, eight-mark questions have a floor of six, while the top level, nine-mark questions require a minimum assessment of eight. An excellent answer to any question above the six-mark level yields a bonus of one mark, raising the seven to an eight, the eight to a nine, and the nine to a ten. The question groups in the crew challenge segment of the exam are chosen at random from among the 12 crew challenges presented during the term. Students are fully informed about the exam design well before the scheduled exam time. High achieving students will be required to engage in reflection if they hope to score highly on the exam as the upper-level versions of the questions require much more than a regurgitation of what they did in the crew challenge itself.

The final deliverable in the course is the Enterprise Evolution Proposal, or EEP, representing our efforts to incorporate project-based learning and reflection into our design. In their solution crews, students are instructed to propose a new and evolutionary enterprise for petGRO that is enabled and/or supported by ICT and that allows petGRO to leverage their core competencies as they transition out of manufacturing into the services marketplace. A cost-benefit analysis is required as part of a presentation to sell the proposal to senior management at petGRO and beans4all. We encourage and reward creativity in this summative project. The assessment rubric includes an explicit component entitled "the WOW Factor" where student creativity is graded. Students are instructed to consider all the crew challenges and petGRO's core competencies and then to apply their imagination and new-found business acumen to create something unique and valuable for petGRO. The project is wide-open and to out-perform their peers, students must engage in significant thought, effort, and reflection on the course materials. The final projects and presentations differ widely across crews with some teams having brought in live animals, 3-D printed objects, and drones; one crew delivered a portion of their pitch as a rap.

4. INITIAL RESULTS AND DISCUSSION

Two of the authors taught two sections each of the course over the winter 2015 term during which data collection occurred. The instructor is unique to a section, but all course material is identical. Data collection occurred across all four offered sections. Of the 302 students for whom final grades were submitted, 276 completed an online intake questionnaire (91% response rate), while 236 students completed the exit survey (78% response rate). A total of 224 had matched intake and exit surveys (implied 74% response rate). It is the matched group upon whom we report the following background characteristics. Students who participated were incentivized by a 3% bonus mark. Table 2 presents baseline characteristics of the matched students.

Aspect	Characteristic	Findings (%)
Graduated secondary school	Two years previous	68
	Three years previous	16
Year in program	Second	85
	Third	11
Residency and language profile	Domestic / English	68
	Domestic / other	13
	International / English 2nd language	16
	International / English	3
Program status	Core of business degree	84
	Minor in Business (other faculty)	14
Course load	Full (5 courses)	66
	Reduced (4 courses)	23
	Overloaded (6 courses)	10
Interest in IS at intake	Reported 3 or lower on 5-point Likert where 1 = low interest	77
Grade expectation	At least A- (80%)	57
	At least B- (70%)	41

Table 2. Student Population Characteristics

4.1 Results

As stated in the introduction, the specific goals of the course redesign were to 1) increase interest in IS, 2) provide skills for

academic success, and 3) provide skills for employment success. We acknowledge that we do not have direct measures to assess our stated goals, but we do report on some matched Likert-scale items administered in both the intro and the exit instruments completed by the students that are relevant. These four items are shown in Table 3.

Item #	Item Description
1	The course content will be/was **interesting (IS Interest)**
2.1	Knowledge and skills that I will/have obtain(ed) from this course will be **useful** to me in other courses **(Skills for academic success)**
2.2	This course will/has help(ed) me improve my **academic** skills **(Skills for academic success)**
3	Knowledge and skills I have will/have obtain(ed) from this course will improve my **career** prospects **(Skills for employment success)**

Table 3. Salient Items in the Entrance and Exit Surveys

Responses to each statement were collected on a five point Likert-scale with a 1 indicating strong disagreement with the statement and a 5 indicating strong agreement. Matched subject differences between the entrance and exit survey responses are shown in Table 4.

	Interesting	Useful	Academic	Career	Average
Static	47.8	49.1	50.0	46.4	47.6
Decline	22.8	18.8	30.8	25.0	23.9
Increase	29.5	32.1	19.2	28.6	28.5
Ratio I/D	1.3	1.7	0.6	1.1	1.3
t-stat	-1.538	-2.768	2.592	-0.063	
p	0.126	0.006*	0.010*	0.527	

*statistically significant p<=0.05

Table 4. Difference between Entry and Exit Assessments

On average, 47.6% of respondents reported no change in their responses between the entrance and exit surveys items. Almost 24% reported declines in their assessment of the class versus their expectations going in. Just over 28% were more favorable in their assessment after having taken the course. The only measure having declined was our students' assessment of the value of the course for their academic skill development with a ratio of increases to declines of 0.6. The ratio for the remaining four measures were all positive. Matched paired t-tests between entrance and exit survey responses were run on each item. Two of the four measures showed statistically significant differences. Of these, one was positive (the course will be useful in other courses) while, somewhat paradoxically, students reported that the course was less likely than anticipated to improve their academic skills.

We also collected data on students' interest in information systems in both the entrance and exit surveys as detailed below.

1. Entry: I've entered this course with a strong interest in IS/IT
2. Exit: I feel the course has increased my interest in IS/IT

Participants responded to the above statements on 5 point Likert-scale with a 1 indicating strong disagreement and a 5 indicating strong agreement. While the specific 'IS interest' measures are not identical in the entrance and exit surveys, it is informative to view them together as they are both assessing the same underlying construct. Results are shown in Table 5.

Level	IS Interest Entry	IS Interest Exit
1: Strongly Disagree	10.3 %	5.8 %
2: Somewhat Disagree	37.5 %	20.1 %
3: Neither Disagree or Agree	25.9 %	24.6 %
4: Somewhat Agree	20.5 %	42.9 %
5: Strongly Agree	5.8 %	6.7 %
Total	100 %	100 %

Table 5. Student Interest in Information Systems

Nearly 50% of respondents reported disagreement with having a strong interest in IS at the entry of the course. At exit, approximately 50% of the students reported that the course increased their interest in IS, 25% expressed no change in interest in the topic, and approximately 26% expressed disagreement with the statement that their interest in IS increased.

Additional evidence from open-ended comments on instructor evaluations suggests that students find the redesign polarizing. More students had a positive sentiment towards the course than negative, and said students usually referred to the positive impact of regular presentations and the competitive aspect of the classroom environment as instructional elements that they liked. However, there was a faction of students who were quite passionate in their dislike. Of that group of students, the most common complaints were the stress of presenting crew challenges regularly, the use of the excellence scale in grading portions of the class deliverables, and the heavy weighting on group-based deliverables. A few select comments from students reflecting the divergent viewpoints of the class are presented in Table 6.

Select Comments about the Course
I loved the layout of this course. It taught me how to work with people in a group that I did not previously know. It taught me how to work well under pressure. It improved my presentation skills. And it gave me general business knowledge in information systems. I am glad this is a mandatory course as it has taught me a lot about a subject I would not have taken given a choice.
The presentations are really good though it's stressful but I think it's gonna somehow help us in the future
I enjoy the CC […], however this course makes a lot of incredibly intelligent people have a much lower average due to the goings-on in their group. For that I believe it is unfair.
I appreciate how it forces me to step up and do stressful presentations – it is a life skill and I feel like that is what I will be taking away from the class.
I really enjoy the competitive nature of the class. I think it properly prepares me for the real business world, in which I will actually be competing with other people.
It seems the crew challenges require a strong cohesive team, however if you have a few weak links or people with a language disadvantage, you may suffer in terms of marks.
The amount of focus given to the crew challenges takes away from the content in the lectures. I sometime feel that I'm going to class to participate in the CC's and most of my learning is done outside of class.
Very stressful class during the class hours, it was a relief to be out once the 3 hours were done.

Table 6. Selected Student Comments from Teaching Evaluations

4.2 Discussion

Overall, the initial results indicate that perceptions about the knowledge and skills obtained in the redesigned IIS course did not improve with regards to career success. We speculate that as the majority of students were in their second year, perhaps thoughts of career success are not yet on the horizon. Interestingly, there have been many students who took the redesigned course who have contacted us recently expressing gratitude and touting the value of the course, and in particular, having been 'forced' to make so many presentations. Through instructor debriefs, the most noticeable student improvements were in communication skills. Many of the students entered the course with little public speaking or teamwork experience. As evidenced during initial crew challenges, these students demonstrated low or weak projection of voices, poor eye contact, fidgeting body language, and general nervousness that manifested in their arguments lacking clarity and impact. Both instructors who delivered this course concur that for these students, the repeated experience in presenting, coupled with the "surprise" of not knowing if they were presenting, yielded a noticeable and sometimes dramatic improvement in communication skills.

The two questions assessing perceptions of knowledge and skill attainment for academic success (items 2.1 and 2.2 from Table 3) provided evidence in opposite directions. There was a significant increase in the perceptions of the helpfulness of the knowledge and skills obtained for other coursework but a significant decrease in the perceptions of whether 'academic skills' were improved. We suspect this result is because the crew challenges are so central to the course and have over time defined the culture and student narrative about the course, that students focused on crew challenge activities in answering the exit survey question. That is, the students see the value in the presentations, teamwork, and collaboration associated with the crew challenges but do not view those activities as academic.

There was no significant difference in the pre-post assessment of whether the students expected/found the course interesting. While disappointing, it is consistent with some literature that states that one of the reasons that students do not chose IS as a major is because they do not find it interesting (Chipidza, Green, and Riemenschneider, 2016). Countering that argument is the result showing that 50% of the subjects showed an increased interest in IS after taking the course. While it is impossible to attribute the increased interest in IS to any particular feature of the course, we do believe that the radical restructuring is the main determinant of the reported increase. Students are visibly more engaged than in previous iterations of the course and thus we hope can more clearly see themselves working in our exciting discipline.

In delivering the redesigned course we have gained experience in facilitating the classroom experience. Three instructors who have taught the IIS course participated in a modified version of the critical moments reflection process (McDowell et al., 2005). Each instructor was given a framing question ("What opportunities exist within the classroom and course deliverables to ensure students are engaged and motivated?") and within that context identified critical moments in their semester of teaching the redesigned offering. Based on those moments, instructors reflected on their classroom experience and identified lessons learned and implications for practice that should be helpful for those who wish to implement a similar course. What follows is a compilation of said lessons from the instructors:

Create a classroom culture of professionalism, respect, support, and understanding. Many students feel uncomfortable with the structure of the class, so it is imperative that expectations are very clear up front. Specifically, with regards to role-playing, the students need to be told how to act professionally when presenting and writing. The class works best when the instructor can find the right balance between professional expectations and a supportive environment. When the instructor is explicitly encouraging and supportive, the students start to feel more at ease, become more relaxed, and perform better.

Emphasize competition but ensure it's fair and friendly. Students, in general, react well to the competitive environment if it is perceived as being equitable. This requires careful messaging at the beginning of the semester to ensure that the students buy-in to the competitive nature of the class. Offering nominal prizes (for example, chocolate) for the best

presentation of the week can help keep things light, motivating, and reinforce the competitive nature of the course.

Let the class self-police. The classroom can become quite chaotic during the crew challenges. It is often difficult to settle a class of 90 students who have been working feverishly on a crew challenge who may at any moment be called in front of the class to present. Stress, anxiety, and excitement fill the classroom. If you establish the culture of respect early, the students are much better at quieting each other than they are in responding to the continuous nagging of the instructor.

Linkages to core lecture material via the crew challenges need to be made explicit. Students often required assistance seeing how all the course components fit together. Help them see the integration through discussion.

Continuously interact with the students while they work. There will naturally be some disengaged students who don't participate actively during crew challenges. This can be for a variety of reasons including physical space restrictions, group dynamics, or just plain disinterest. Be proactive in re-arranging students within their group and facilitating discussion within the group, ensuring participation of all.

5. CONCLUSIONS

We recently redesigned and implemented an IIS course using experiential and active learning as a theoretical foundation to inform the redesign. At the heart of the redesign was a set of customized, problem-based crew challenges that were contextualized within a simulated environment and required extensive and extended role-playing by the students. We implemented many other course activities that ensured the usage of multiple learning methods. To our knowledge, this is one of the few attempts at an immersive and comprehensive active learning IIS course.

Initial student response to the redesign has been mixed. Survey responses indicate that students have an increased interest in IS after taking the course. Students found the course more interesting than they expected although the difference was not significant. There was a significant increase in perception of the usefulness of the knowledge gained from the course in subsequent courses. However, this result is countered by the fact that perception of whether the course helped improve academic skills significantly decreased. Open-ended comments reveal the polarizing nature of the redesign but with more positive than negative comments.

As with most curricula, the course continues to evolve based on instructor reflection, student feedback (both formal and informal), research results, and accreditation regulations. The inconclusive initial results could be due to many factors alluded to in the literature including the length of the in-class activities (Felder and Brent, 2009) and the lack of reflection time built into the classroom time (Lewis and Williams, 1994). Future iterations of the course will include breaking out the crew challenges into multiple shorter activities as well as reducing the number of crew challenge presentations to create more time for student reflection and instructor-led crew challenge debriefs.

This paper offers a comprehensive example of an IIS course that emphasizes semester-long role-playing in a simulated business context, along with incorporating additional experiential and active learning approaches. While initial results to the redesigned course have been mixed, we encourage our IS colleagues to incorporate experiential and active learning methods into their IIS courses. We feel the redesign has moved the IIS course in a positive direction. Students are visibly more engaged, attendance has increased, and, overall, instructors are excited to be involved in delivering content and facilitating activities in a dynamic classroom environment.

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ISSN 2574-3872