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The effectiveness of intentional design in an online inventory management class

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ABSTRACT

Online education is growing fast. Inexperience with online course design may lead instructors and students to doubt its value. I explore the concept of intentional design for online learning. Student attitudes toward online design elements are measured before and after taking an online class. Elements include online review questions and quizzes, problem solving exercises, collaborative online group work, online discussion board participation, and online video lectures. Results show a positive change in student attitudes toward the value of all these. Contributions include linking intentional design to a measurable instructional effectiveness model and providing practical guidance for online course design.

KEYWORDS: Distance learning, Online education, Supply chain management,
                   Instructional design

INTRODUCTION

Online education is growing quickly in the United States. Students taking at least one online course has increased from 1.6 million in 2002 (9.6% of total enrollment) to 21 million in 2011, or 32% of total enrollment (Allen & Seaman, 2013). This rapid and voluminous growth signals a paradigm shift in that online education is no longer an outlier. Instructors can expect to teach an online course sometime in their career – only 13.5% of higher education institutions have no online offerings, and 62.4% offer complete online programs (Allen & Seaman, 2013). Online education is a tool for addressing our social and cultural circumstances; and providing access to education for working adults, geographically separated individuals, and even those such as refugees caught up in political turmoil (Wexler, 2015).

Despite this rapid growth, skepticism abounds amongst faculty. Faculty acceptance of the value and legitimacy of online programs only slightly increased from 27.6% to 30.2% over the same 10 year period during which online enrollment increased 13-fold - with just over a majority of faculty indicating a "neutral" stance on acceptance of the value and legitimacy of online education (Allen & Seaman, 2013). Another study found 48% of professors who had taught online believe online courses are not as good as face to face classes (Benton, 2009). This represents a problem, because academic leaders believe faculty acceptance of online education is critical to the growth of online instruction (Allen & Seaman, 2013).

This growth of online education means that more faculty are teaching online classes – skeptical or not - and the split in online education's growth and its acceptance amongst faculty means that more students will be exposed to faculty who do not believe online education is valuable and legitimate. This may translate into the attitudes of the students and subsequently have a negative impact on the effectiveness of online classes and programs.

Skeptics may be opposed to online education for a number of reasons including risk aversion, resistance to change, or having one bad experience in an online classroom. This mentality, however, is akin to fear of the unknown (Benton, 2009). We are too quick to say as faculty, "in-residence courses are superior to online classes" either because we have not

experienced personal success or have we been shown the way to this success (Redpath, 2012).

Skeptics of online education may tend to view the online classroom as a set of limitations which keep them from achieving what they are comfortable and skilled in accomplishing in a face-to-face classroom. This is an implicit recognition of the fundamentally different environment of the online classroom. For example, in a traditional classroom there are standards for class start time, time spent lecturing, and ergonomic factors (all students are learning in the same physical environment at the same time). Interaction between students and other students as well as interactions between students and the instructor are also governed, to an extent, by physical environment, meeting time, and office hours. We sometimes take these factors for granted because they are inherently built into the framework of the in-residence class. An instructor's presence is established with the students (physically) the moment he or she walks into the room. There are boundaries and limits set and defined by walls, class time limits, etc. Accessibility is also addressed almost automatically, as the in-resident student has guaranteed access to the instructor during class times, and most instructors have established office hours outside of class to meet with students.

The other major difference is in the students themselves. Most in-resident students are either full-time or must separate class meeting time from the rest of their schedule. This creates a sense of separation between the classroom learning experience and work, family, and social activities which may influence the amount of time, focus, and effort a student devotes to a class. The fundamental differences discussed above are presented in table 1 below.

Table 1: Fundamental differences between in-residence and online

In Residence	Online
Physical Characteristics of Environment	
Class start time is set	Arbitrary "start" time is up to student
Class length is set	Student consumes material at own pace
Students are in same physical environment	Students' environment varies greatly
Students are physically together	Students are geographically separated
Boundaries set by space and time constraints	No physical boundaries for the classroom
Social Characteristics of Environment	
Students may interact synchronously in class	Students must coordinate synchronous interaction or participate in asynchronous interaction
Instructor presence established during class	Instructor presence must be intentionally planned and executed by instructor
Students guaranteed instructor access in class	Students access to instructor limited to email, phone, or coordinated online meeting times
Students access instructor during office hours	Usually accomplished through email
Student Characteristics	
Full-time or standard set-aside class time	Part-time with full-time jobs
Work and school are separated by space and time	School may be accessed from work
Home and school are separated by space and time	School may be accessed from home

The risk is that instructors identify the differences as threats to the way they know how to conduct a class. Often times, those most averse to online education are those with the little or no experience teaching online (Redpath, 2012). Additionally, delivery method is sometimes

confounded with instructional design (Bernard et al., 2009). It takes intentionality on the part of the instructor to establish presence, set boundaries, facilitate communication among students, and guarantee access. I've heard it said that a major drawback of online classrooms is the inability to have meaningful discussion, but the conversation usually stops there without realizing that replication of the in-residence classroom is not the goal of an online course (Brewer & Brewer, 2015). My question is, "what is the purpose and outcome of that discussion?" If the answer is something that can only be accomplished via face to face interaction, then the statement holds. Research suggests that the underlying factors which may be increasing student enjoyment are richer social interactions, feedback, and exchange of information associated with the traditional classroom (Nemanich, Banks, & Vera, 2009). So the instructor should be asking – "how can I achieve these objectives in the online classroom?"

The answer may lie in intentional design. The factors mentioned above may be a built-in part of the traditional face-to-face classroom, however, they are not so in an online classroom. The questions addressed in this research are how to intentionally achieve these same abstract characteristics in the online environment, and how much difference does intentional design make in changing student perceptions of online learning?

This research represents an important theoretical and practical contribution to innovation in online teaching. Theoretically, it connects the concept of learning design to a measurable instructional effectiveness model by showing how intentional design factors can change student satisfaction and attitudes. Practically, it shows how the learning design concept can be easily applied by mainstream educators, which is an area lacking in previous research (Burgos & Griffiths, 2005; Cameron, 2009).

LITERATURE REVIEW AND BACKGROUND

Purpose

The purpose of this study is two-fold. First, it is to reach out to the skeptics of online learning to show that intentional design and treatment of online environmental differences as opportunities (rather than threats) can influence outcomes in terms of student perceptions and attitudes. Second, it is to explore the effectiveness of several intentional design factors, drawn from best practices, which were implemented in an online course. The results show positive changes in student attitude toward each design factor.

Description of students, class, and program

The process described in this paper took place during the design and execution of a fully-online, introductory inventory management class. The class consisted of 12 graduate students, 10 of whom were part of a fully-online Master of Science program. The remaining two students were enrolled in the online course to supplement in-residence programs. The students' majors included Logistics and Operations Research, and all the students had taken classes in their respective programs prior to this class. The 10 online-program students were full-time military officers in operational jobs, where the typical work week consists of 40-60 hours. The full-time officers are also subject to frequent disruptions such as base exercises, temporary duty away from home-station (days to weeks in duration), and long-term deployments (6 months or longer). The 10 online-program students had all taken online courses prior to this course.

Although the methods and techniques described in this research apply to this group of graduate military students, the practical and theoretical implications apply to undergraduate and graduate online education in general. The methods, techniques, and intentionality discussed in this paper bear no unique relationship to either the level or profession of the student, and are

generalizable to all online education. These methods are based on intentional design and delivery rather than a specific pedagogical aim toward graduate or undergraduate education.

In this study, I map the Mashaw (2012) model of online instructional effectiveness to several intentional design elements and show how these design elements may be responsible for a change in student attitudes and ultimately increase online instructional effectiveness. It is important for the skeptic to realize just how easily student attitudes and online teaching effectiveness can be affected by a few intentionally designed elements.

What constitutes effectiveness?

The education system is shifting from a process-centered to a learner-centered environment, where learning outcomes and competency-based education are the new standard (Aggarwal & Lynn, 2012; Levine, 2015). Mashaw (2012) discusses the elusiveness of measuring effectiveness as well as the holistic nature of student learning, and states that there is no clear definition of effectiveness. Mashaw develops a model for effectiveness which includes multiple facets of this holistic view, using satisfaction and student self-reporting to capture the concept of effectiveness. This model draws on previous research that shows student satisfaction and attitude are important elements used to measure student success across varying contexts (Alavi, Wheeler, & Valacich, 1995; Arbaugh & Benbunan-Finch, 2006; Graham & Scarborough, 2001). The model also accounts for how perceived learning and satisfaction have been used to study effective techniques in online environments (Eom, Wen, & Ashill, 2006). In these studies, satisfaction is used as a measure of effectiveness.

The overall goal of Mashaw is to show effectiveness as the result of the total synergy of various factors influencing the learning process and to develop a model to capture this holistic measure of effectiveness in a single numerical value. This holistic view of effectiveness is underpinned by the idea that the instructor serves as a mentor to guide and motivate students and to facilitate learning.

Explanation of Effectiveness Model

The model presented by Mashaw includes six constructs and 27 factors forming these constructs. A brief explanation of each of the constructs is provided here. The learning experiences construct captures the extent of learning through factors such as "changes in skill, comprehension, application, attitude, and competencies." The facilitator construct captures how the instructor can create an environment suitable for online learning through clarity, goal communication, inspiration, and encouragement of exploration and discovery. This environment requires an intentionally designed structure in an online course because of the abstract factors and differences listed in table 1. The technology construct focuses on the ability and design of the learning management system (LMS) to facilitate learning and includes factors of usability, dynamic and novel sessions, and modular presentation and flexibility. The interaction and participation construct captures social and environmental factors such as ease of communication, speed of response feedback, and encouragement and motivation of participation. The mentor's inspiration construct captures how the instructor can encourage learning through factors such as activity design, motivation of critical thinking, and individual assistance. Finally, the construct of hindrance and discouragement focuses on removing factors associated with student demotivation. This construct captures the negative effect of pitfalls such as technical frustration, boring content, and lack of guidance. Altogether these constructs characterize the idea of instructional effectiveness as a holistic outcome which is more than the sum of its parts (Mashaw, 2012).

CONCEPT DEVELOPMENT

Design for Effectiveness

The model presented by Mashaw explains what effectiveness is, how it can be conceptualized as a single number, and which factors and constructs have bearing on the overall holistic measure. However, for the online instructor designing a course, and for the skeptic, one needs to answer the question: "How can a course be designed to target effectiveness?"

In the design of a course, the philosophy of continuous improvement should be incorporated (Aggarwal & Lynn, 2012). Best practices in online design should be employed in order to target effectiveness factors (Redpath, 2012). Guides and suggested best practices can be found on many university websites as well as in published studies about online and flipped classrooms. The design elements incorporated here were taken from a synthesis of best practices deemed most applicable to this course (Asef-Vazeri, 2015; Brewer & Brewer, 2015; Hanover Research Council, 2009; Flipped Classroom Field Guide, n.d.; Keengewe & Kidd, 2010). The following section describes how intentional design elements were used in order to try and create presence, usability, interaction, flexibility and accommodation, and understanding and comprehension.

Presence

An online presence was created by using elements which would lend structure to the virtual classroom. These elements included the LMS announcement structure, interaction using online discussion boards, the timeliness of material release, deadlines, scheduling and tempo, and finally instructor availability.

Class announcements were structured to give the course a visual timeline and boundaries, as well as to frequently give feedback to students. In all, 28 announcements were posted over the course of the 10-week quarter. A standard weekly announcement was released at the beginning of each academic week with an emphasis on weekly topics and goals for the week. Additionally, announcements were posted with general feedback on assignments. Explanatory announcements were posted if a number of students had difficulty understanding a particular topic.

Student to student and student to instructor presence was encouraged with the use of discussion boards. Discussion board assignments included peer-feedback. There was also a question and answer forum discussion board where students could post questions (anonymously if desired) to be answered either by other students or by the instructor. The instructor standard for answering questions posted here was within 24-hours, although many of the questions were answered very shortly after students' posting.

Scheduling was intended to create a boundary structure not automatically present in an online classroom. Each class week started at 12:00 AM on Monday morning and ended at 11:59 PM the following Sunday night. Students were informed of this structure up-front and the format was standard throughout the course. Release of course materials for student viewing was done on the Wednesday prior to a class week starting. For example, materials for week three were released to students on Wednesday of week two. This insured that online students (keeping in mind that these are working adults with full-time jobs) were afforded a full two weekends to access reading assignments, online videos, and exercise assignments. This structure dictated the tempo of the course, which was set on a weekly basis by topic. The deadlines, material release, and announcements set clear guidelines and boundaries for student goal "chunks."

Finally, instructor availability was ensured to facilitate the enforcement and feasibility of the temporal structure of the class. The instructor was available via email 24 hours a day, 7

days a week. The service guarantee of a 24-hour or less response time ensured student knew up-front what the expectation was, and could plan accordingly. Although most emails were responded to within a very short period after students' sending them to the instructor. The instructor was also available for live access via telephone or video calling when requested by students. An enhancement to availability could be made by scheduling live office hours via chat, hangout, or other technology-enabled conference space. However, the flexibility afforded by allowing students to schedule independent consultations with the instructor as needed was valuable.

Usability

The usability of the course was of utmost importance in the design phase. Student feedback from previous courses indicated factors such as hard-to-watch video lectures and lack of a friendly user interface. The primary elements used to enhance usability were the video lectures, streamlined and standard course design, and the use of technology (LMS) to deliver this design.
        A total of 45 videos were produced in modular format, meaning the videos covered topics in small "chunks" meant to be independent rather than taking a traditional hour long lecture and simply converting it to video format. The design goal was to make all videos 10 minutes or less in length. This goal was adhered to whenever possible, but there were several longer videos with no logical break point for separating them into shorter segments. For example, the working of one example problem took more than 30 minutes. This was a demonstration of a complicated procedure which required step-by-step demonstration. Although much longer than the design-specified goal, this was necessary to convey information to students. Of the 45 videos produced, the average length was 10:06. A majority (62%) of the videos met the goal of 10 minutes or less. Of the videos which exceeded the 10-minute length, the average overrun was 6:47, with only three lasting longer than 20 minutes and only two of those lasting longer than 30 minutes (the longest video was 39:25).
        Standardized and streamlined visual and organizational design was used to reduce student fatigue and the learning curve involved with course structure and LMS use (Reisner, 2015). The course was designed and delivered using Blackboard LMS. Once the students were introduced to the material for the first week of class, the course framework did not change. The steps needed to access course content did not change throughout the course. Each class session had a corresponding folder in the course content section of the LMS. In each session's folder, which was on a timed released as described above, was an outline consisting of goals, reading assignments, video lecture assignments, exercise assignments, links and descriptions of discussion board post assignments, and links for turning in assignments via the LMS. All course content was presented from within this framework in one location, so that a student spent minimal time jumping from content area to content area and could focus on the flow of the lesson for the class session. This also built more structure into the course in that the students could visually see the boundaries of each class session within this streamlined LMS framework. The technology used to deliver this LMS experience was accessible to anyone with an internet-capable device and an internet connection. Once enrolled in the LMS class, students were not required to take any additional steps for access to course material.

Interaction

Interaction was a key element of the intentional design process. Both student-instructor and student to student interaction were considered, as these have been linked to a positive effect on student learning (Bernard et al., 2009). Research has also called for design of online education to facilitate more purposeful interaction (Abrami et al., 2011). The main design elements used to

ensure an interactive course were service guarantees, use of online discussion boards for peer and instructor feedback, group exercise assignments, and a group project.

Service guarantees come from the service operations management world, and have been incorporated into online or blended courses in the past (Bregman, 2012). The idea is that students will have increased satisfaction with the course due to clear, precise, and well-communicated expectations. Service guarantees are also low-cost to the instructor, force accountability and performance, and add value for students by demonstrating that performance expectations are a two-way street, which in turn generates credibility and trust in the instructor-student relationship.

Peer feedback via the LMS discussion board and assigned group work was used to facilitate meaningful conversation amongst student groups with regard to a class project. Although the outcome of required group work may depend on individual differences (Smith & Kellog, 2015), the intent was to give students the valuable opportunity to learn from one another and incorporate feedback from their peers into the improvement of the project. This was designed to accomplish the purpose of exploiting the experience of the students and enhancing collaboration efforts across groups of students.

Flexibility and accommodation

This course was designed with flexibility and accommodation measures in mind. The challenge was to realize that the student group faced extremely difficult circumstances in some cases. The students were all active duty military officers and 83% of them were only part-time students. Their full-time jobs consisted of 40-60 hour work weeks, temporary duty trips away from home, and even extended deployments of 6 months or longer. Although these were extraordinary challenges which had to be incorporated into the design of the class, the same academic standards had to be applied to all students. The key design element incorporated here was clear expectations and clear communication with the students. More so than with a traditional student group, rates of communication had to be high and follow-up for missed deadlines had to be quick. The key was accommodating students' needs while not relaxing standards.

Understanding and comprehension

The assurance of understanding and material comprehension was essential and foundational. In order to lend to the structure development of the online classroom, frequent assessment of student progress and comprehension were needed. It has been observed in other online classes (K. Schultz, personal communication, December 15, 2015) that students in an online classroom are harder to "bring along" than in-resident students once they have begun to fall behind. To address this need, a quiz was administered at the beginning of each session in order to motivate the students to read and watch the online videos and to assess the students' comprehension of the material at a very basic level. Problem solving exercises were assigned and due on a weekly basis in order to (1) help the students learn and apply the material presented in the reading and lectures and (2) to assess a deeper understanding and an application level of comprehension. The quizzes were scored instantly and feedback was given on the other assignments on a weekly basis. Additionally, active learning exercises using spreadsheet modeling (Strakos, 2016) were successfully used to engage students in learner-centered activities.

Applicability and connection (constructivist design)

In addition to the understanding and knowing levels of comprehension, the course project was designed to facilitate application of concepts and to boost the students' ability to synthesize course knowledge and solve real-world problems by connecting material to business operations. The project was assigned in pieces and feedback was given throughout the quarter. This was intended to encourage the student to work on manageable sections of the project and to guide them in the process of analyzing a real-world inventory problem.

When compared to Mashaw's model of effectiveness, the intentional design mechanisms described above directly map to many of the model's influence factors, as illustrated in table 2 below.

Table 2: Mapping the effectiveness model to course design factors

Construct	Factors	Intentional Design Mechanisms
Learning Experiences	• Understanding and comprehension • Changes in thinking attitude, behavior, or belief • Appreciation for value of learning • Confidence to apply concept • Confidence to handle real-world cases	Quizzes, Problem solving, Project, Feedback structure (peer and instructor), Pre and post class survey
Facilitator Creates online environment of learning	• Identify learning objectives or goals • Modular presentation with clear interconnection • Inspiration to continue • Encourage exploration and discovery	Clear, explicit goals, Modular standardized presentation, Usable timely feedback, challenging problems, project structure, timelines, material release, deadlines, schedule
Technology	• Interface design and usability • Content, organization, and appeal of material • Interactive and dynamic sessions with novelty • Usability of LMS • Flexibility of modules based on control of learner	Streamlined, standardized content presentation, scheduled release, interaction through project and discussion board, instructor flexibility, flexibility inherent with asynchronous structure
Interaction and participation	• Ease of communication (instructor and others) • Reasonable response time to questions; live discussion • Encouragement of participation and motivation for getting involved	Service guarantees, peer feedback, Q&A forum, instructor availability, live feedback sessions
Mentor's Inspiration	• Explanations and presentation methods • Design, challenges, and appropriateness of assignments • Motivation technique for critical thinking • Timely feedback about the student's progress • Assistance at the individual level	Lessons designed to take students from information transfer to application, reading, watching, doing, evaluating others, incorporating feedback, service guarantees, use of LMS grade book, frequent email interaction with individuals, availability for live interaction
Hindrance and discouragement	• Technical frustration and stress • Boring or static content or presentation (lectures) • Dissatisfaction resulting from inflexibility • Discontent from disappointment or unreasonable assignments • Lack of guidance or learning assistance	Standard LMS format, short, creative, and dynamic lecture videos, flexibility based on student needs, peer and instructor help if bogged down on assignment (environment of open questioning), structured to connect goals, timelines, and assignments to LOs and concepts

Proposition: These intentional design mechanisms will improve students' perceptions and satisfaction with the course, therefore improving overall effectiveness.

METHOD AND ANALYSIS

The students were administered a survey about their attitude and perception of online learning and specific learning activities prior to class and at the completion of the class. The questions used to measure student perceptions of the class and specific activities were adapted from Lage, Platt, & Treglia (2000). Students answered these questions on a five point Likert scale and were also given the opportunity to provide qualitative comments to an open-ended question. The Likert scale responses ranged from "strongly disagree" to "strongly agree."

The Likert scale questions were intended to capture student perceptions and attitudes about the online classroom in general as well as specific elements of the course design. The questions were as follows.

Q1: "I am excited about learning in an online classroom."

Q2: "Given the choice, I would prefer to take an in-residence class."

Q3-7: "I am looking forward to:" [stem of question used in the pre-class survey] OR "The following class components were a good use of learning time:" [stem of question used in the post-class survey].
Online review questions / quizzes.
Problem solving exercises.
Collaborative online group work.
Online discussion board participation.
Online video lectures.

Q8: I would rather complete a course project than take a proctored mid-term and final exam.

Q9: Please enter any additional thoughts you may have about taking a distance learning class online (optional).

The results of pre and post-class surveys were compared using a method which has been employed in the assessment of a similar online management science course (Gupta, Mau, & Richardson, 2014). The mean response scores for each question were compared between pre and post-class responses using an independent samples t-test in SPSS. The independent samples test was used because matching data was not collected for a paired samples t-test. The results of this test and a summary of the student's responses to questions one through eight are presented in table 3 below.

Table 3: Results of pre and post-class surveys

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Pre-Post Change
	Pre-Class Responses						
	Post-Class Responses						
I am excited about learning in an online classroom.	2	4	6	0	0	2.33	0.50 (ns)
	1	3	5	3	0	2.83	
Given the choice, I would prefer to take an in-residence class.	0	0	2	3	7	4.42	0.25 (ns)
	0	0	0	4	8	4.67	
I am looking forward to:	(The pre and post-class survey questions were identical with						
The following class components were a good use of learning time:	the exception of the stem statement as indicated.)						
Online review questions / quizzes.	1	1	7	3	0	3.00	1.25*
	0	0	0	9	3	4.25	
Problem solving exercises.	1	2	4	3	2	3.25	1.00*
	0	0	0	9	3	4.25	
Collaborative online group work.	3	1	4	2	2	2.92	0.33 (ns)
	2	1	4	2	3	3.25	
Online discussion board participation.	1	1	4	4	2	3.42	0.08 (ns)
	1	2	2	4	3	3.50	
Online video lectures.	1	2	4	5	0	3.08	1.42*
	0	0	1	4	7	4.50	
I would rather complete a course project than take a proctored mid-term and final exam.	1	2	1	1	7	3.92	0.17 (ns)
	2	0	0	3	7	4.08	

These results clearly show that students' perceptions of three factors used in the design of the course changed drastically – going from a near-neutral perception of the activity to a positive perception of the value of the activity. These activities, online video lectures, online

review questions/quizzes, and problem solving exercises can be mapped to online effectiveness as presented in table 2.

In addition to these statistically significant differences in mean responses, a comparison can be made as to the level of overall agreement or disagreement in the before and after class students as in Gupta, et al. (2014). The results of this before and after comparison of agreement or disagreement are presented in figures 1 through 8 below.
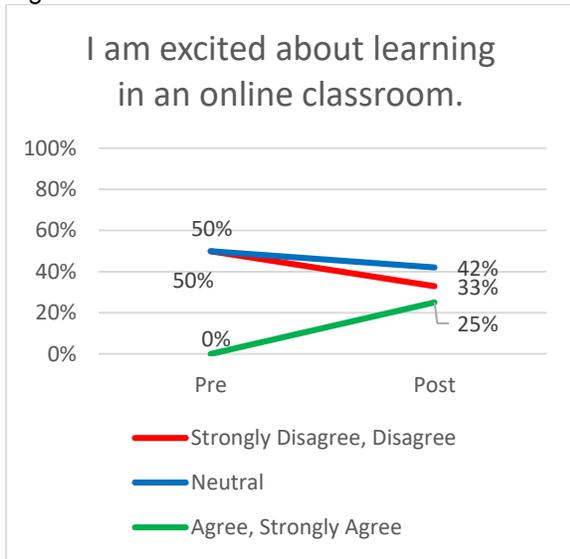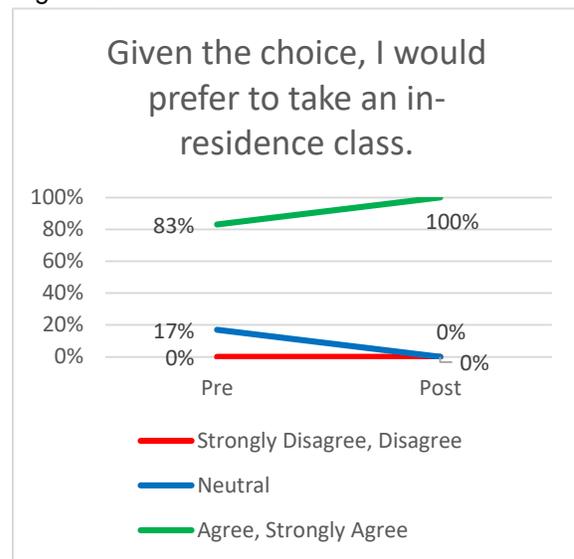
Figure 1: Online classroom attitude

I am excited about learning in an online classroom.

Strongly Disagree, Disagree
Neutral
Agree, Strongly Agree

Figure 2: In-residence classroom attitude

Given the choice, I would prefer to take an in-residence class.

Strongly Disagree, Disagree
Neutral
Agree, Strongly Agree

The following questions were asked with a stem of "I am looking forward to:" for pre-class surveys and "The following class components were a good use of learning time:" for post-class surveys.
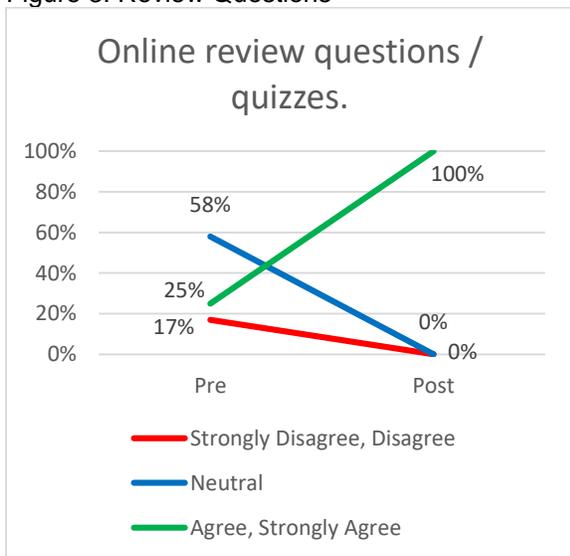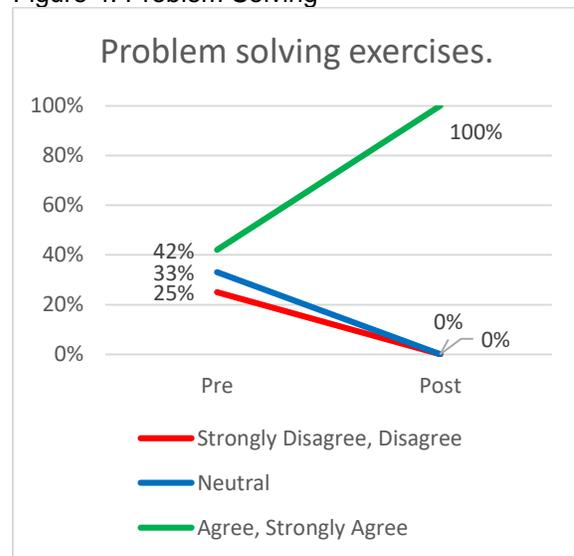
Figure 3: Review Questions

Online review questions / quizzes.

Strongly Disagree, Disagree
Neutral
Agree, Strongly Agree

Figure 4: Problem Solving

Problem solving exercises.

Strongly Disagree, Disagree
Neutral
Agree, Strongly Agree

Figure 5: Group Work

Collaborative online group work.
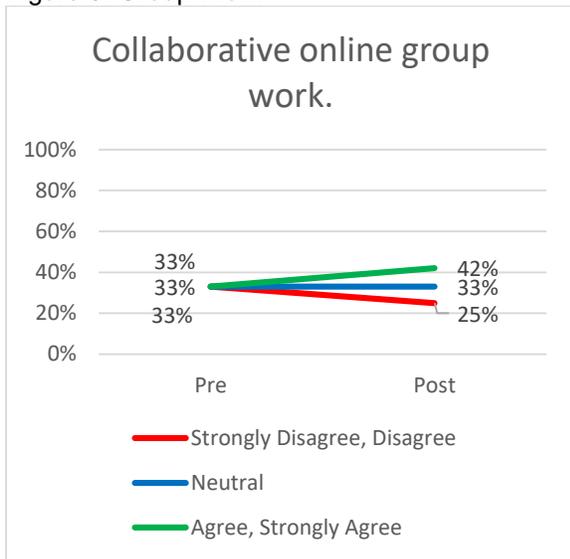
Figure 6: Discussion Boards

Online discussion board participation.
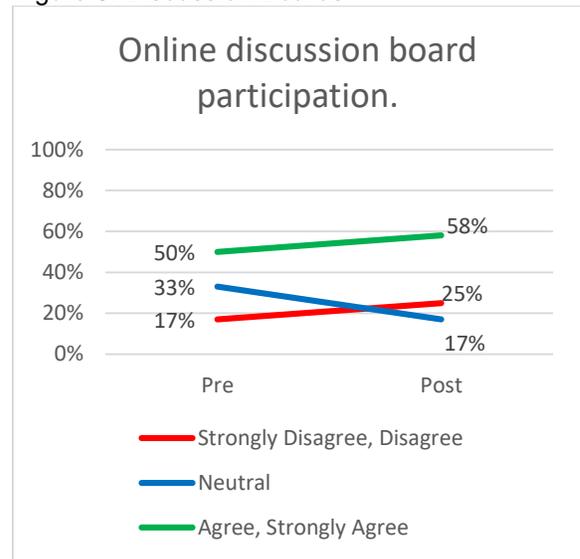
Figure 7: Video Lectures

Online video lectures.

Figure 8: Course Project

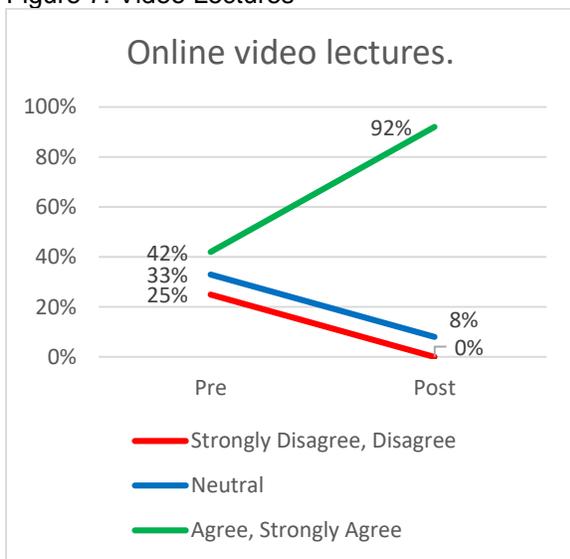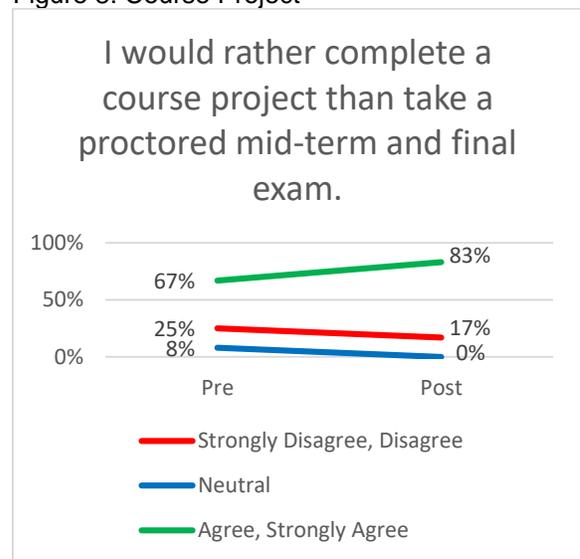## I would rather complete a course project than take a proctored mid-term and final exam.

Although not all before and after class responses were statistically significant, figures 1 through 8 show the students had at least some change in attitude toward all the intentional design elements captured by the survey. These results provide evidence that intentionally designed online learning best practices improve students' perception and attitude about the elements of the class. Given that overall effectiveness is characterized as a holistic synergy of design elements, an improved learning experience is likely to be a result.

In addition to the quantitative results of the survey, open-ended comments were collected. It is perhaps these candid comments that capture the best evidence of a change in student attitudes toward the online learning environment and provide support for the effectiveness of the intentional design features incorporated into this class. These comments also provide valuable insight as to why the students' perceptions of the value of the online learning environment in general were skeptical.

Student responses to the open-ended question, "Please enter any additional thoughts you may have about taking a distance learning class online (optional)" are provided below.

Pre-class comments

"I'm not sure how well this DL online collaboration thing is going to work. Already in my group we have completely different time zones to contend with, so there is no live interaction. … Hopefully it will work out."

"…I am highly against distance learning…I don't have the time to devote to these online classes that I would like."

"The most challenging part…is obviously balancing our (sometimes demanding) work schedules with a structured weekly course. …DL students struggle with being treated like In-res students during previous courses. An example is when we were expected to watch the entire lecture that they sit through when (with some teachers) half of what the class discusses with the professor is chit-chat."

"Having taken several online courses, both undergraduate and in this program, I have strong reservations about a group project for DL students...several of my classmates who are serving overseas (myself included…) who will have to work out scheduling conflicts due to time zones…on top of balancing a challenging program with families, work, [etc]."

"DL classes through [institution] have been hit or miss so far...the least effective delivery method has been straight recordings of the In-Res lectures..."

Post-class comments

"I really appreciated [the professor] and how he considered what the DL students had been saying about our limited time. His flexibility was refreshing to say the least, and the fact that he was quick to respond to our emails was great…Overall, this was a much better class than we've had in the last several months."

"Great format...the grading structure is very beneficial to [online]...It still requires you to know the material, but reinforces it more than taking a test when you have to practically apply it."

"…I am still very against this particular program being in an online setting. I do not feel DL learning is as effective as in-residence."

"The group project as a DL group was a good thing. We had a goal, a reason to meet each week, and if someone missed out they could make up the next week."

"Group Homework that is due within the week (especially spreadsheets) is NOT done as a group…it's the first person to get to the session that completes it."

"The asynchronous format was outstanding! I liked the modular feel of the course content and it allowed us to work the program around our professional/personal lives much more easily! Small group collaboration was fantastic, much better than forced discussion board posting that often isn't very meaningful…"

"The online collaborative group project is not effective. It takes distance students literally days or the entire week to achieve the same level of collaboration that the in-residence students can get face to face in 15 minutes..."

RESULTS

Pre-class Comments indicate a varying, but generally negative attitude toward online learning. As indicated by the pre-class survey, students would overwhelmingly choose to take an in-residence class. Due to this factor, and additional question was added to the post-class survey,

which, when combined with the qualitative comments, sheds additional light on the students' overall perception of online learning. This question was intended to gauge if the students would have voluntarily enrolled in the online program, or were attending only because they were selected and enrolled as a part of a professional development program. The question and its results are as follows.

"I wanted to participate in the [institution's] DL Master's program."

Choices and responses: "Yes" - 0   "No" - 4   "I only wanted to attend in-residence" - 8

This reveals a peculiarity of this program which makes changing the attitudes of the students even more difficult than it would be with a group of students enrolled in an online program due completely to their own motivation.

The pre and post-class survey was not designed to measure the entire student experience, but to gather student perceptions of very specific learning activities built into course and to measure general overall changes in attitude toward the online classroom. In general, however, student perceptions of the online classroom improved as a result of taking this course.

Qualitative comments show a definitive change in attitudes toward online learning in general. Although one post-class comment indicated a doubtful and critical attitude of online learning, the overall tone and content of the comments marks a drastic change in attitude, confidence, motivation, and satisfaction with online learning and the intentionally designed elements of this course which were incorporated to improve effectiveness. The online comments concerning group work and discussion board usefulness corroborate the quantitative results.

These results indicate that the most successful elements of this class were the online quizzes, problem solving exercises, and online video lectures. These elements show promise as to the power of simple yet intentional design in improving online learning effectiveness. Overall, the factors created structure by design and presence by incorporating flexibility and ensuring accessibility. Additionally the design facilitated usability, interaction, understanding and comprehension, and applicability and connection.

IMPLICATIONS AND DISCUSSION

In terms of the objectives of this research, which were (1) to explore how intentional design can be incorporated to improve online learning effectiveness and (2) to reach out to skeptics, several conclusions can be drawn. First, from the quantitative and qualitative survey results, we can see that several simple yet specific intentional design factors can change student perceptions.

Second, the results point to how these and other basic applications of best practice can transform the characteristic differences between the online and in-residence classroom from threats to opportunities. When teaching an online class that one has previously taught in-residence, start with a vision and build the course based on best practices. Keep in mind that small changes in design make a big difference in delivery and effectiveness when it comes to the online classroom. Use a step by step approach similar to in-residence course design (Fink, 2013). Ask first, "Where do I want to go?" and then determine the best way to get there.

When considering the limitations of this study, keep in mind that it is conceptual in nature, yet incorporates enough evidence to draw some basic conclusions. It is not a confirmatory study, nor is there a hypothetical model presented. The intent is to contribute conceptual and practical value by linking the intentional design method employed to a model of online learning effectiveness. Additionally, the empirical evidence is from a small sample size

and is limited to military students. However, this group of students share many characteristics with all working professionals in terms of part-time study, job and family commitments, and geographic dispersion. The study and its empirical findings are not intended to provide proof, but practical evidence of the value of intentional design.

One of the most difficult aspects of teaching working adults is keeping up with the students as a teacher. The teacher must always seek to add practical value for the student while maintaining academic rigor and meeting course goals. A notable contribution of this research, as discussed by Falconer and Littlejohn (2007) is that the intentional design framework employed here can be shared and reused via the LMS, providing a low-cost, high-value asset for other faculty engaged in online teaching. In the future, research should follow up with determining what the best factors are in online course design. Academically speaking, this future research should look at a cost to outcome ratio of incorporating certain design elements. Additionally, more empirical studies of how specific course design elements are related to specific measures of effectiveness should be conducted. None of the ideas presented here are new in and of themselves. However, the demonstration of their value in a practical setting should motivate and inspire skeptical students and teachers alike. The synergy of intentional design and best practices promises to be of value for the future of online teaching effectiveness.

CONCLUSION

Online education is increasing, so one can either embrace it or try to catch up when eventually faced with teaching in an online program. The consequences of viewing online education as online delivery of in-residence courses can be detrimental for students and their perception of programs as well as to the attitude of the instructor who may experience limited success with this method. For the skeptical online instructor, no one study can remove skepticism. However, studies of this nature should provide a glimmer of hope that effort invested in intentionally designing online courses will pay dividends in student and instructor success. The key to this success is to address fundamental differences between the in-residence and online classroom as opportunities rather than threats.

REFERENCES

Abrami, P. C., Bernard, R. M., Bures, E. M., Borokhovski, E., & Tamim, R. M. (2011). Interaction in distance education and online learning: Using evidence and theory to improve practice. *Journal of Computing in Higher Education*, 23(2-3), 82-103.

Aggarwal, A. K., & Lynn, S. A. (2012). Using continuous improvement to enhance an online course. *Decision Sciences Journal of Innovative Education*, 10(1), 25-48.

Alavi, M., Wheeler, B. C., & Valacich, J. S. (1995). Using IT to reengineer business education: An exploratory investigation of collaborative telelearning. *MIS quarterly*, 293-312.

Allen, I. E., & Seaman, J. (2013). Changing course: Ten years of tracking online education in the United States. *Sloan Consortium*. PO Box 1238, Newburyport, MA 01950.

Arbaugh, J. B., & Benbunan-Finch, R. (2006). An investigation of epistemological and social dimensions of teaching in online learning environments. *Academy of Management Learning & Education*, 5(4), 435-447.

Asef-Vaziri, A. (2015). The flipped classroom of operations management: A not-for-cost-reduction platform. *Decision Sciences Journal of Innovative Education*, 13(1), 71-89.

Benton, T. (2009). Online learning: Reaching out to the skeptics. *Chronicle of Higher Education*. September 18.

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, 79(3), 1243-1289.

Bregman, R. L. (2012). 'Eating your own dog food': Applying course concepts in your teaching. *International Journal of Innovation and Learning*, 12(3), 319-331.

Brewer, P.E., & Brewer, E.C. (2015). Pedagogical perspectives for the online education skeptic. *Journal on Excellence in College Teaching*, 26(1), 29-52.

Burgos, D., & Griffiths, D. (2005). "The UNFOLD Project. Understanding and using Learning Design." Educational Cybernetics: Reports.Paper 8. Available at http://digitalcommons.bolton.ac.uk/iec_reports/8

Cameron, L. (2009). *How learning design can illuminate teaching practice*. The Future of Learning Design Conference. Paper 3. December 10. Available at http://ro.uow.edu.au/fld/09/Program/3

Eom, S. B., Wen, H. J., & Ashill, N. (2006). The determinants of students' perceived learning outcomes and satisfaction in university online education: An empirical investigation. *Decision Sciences Journal of Innovative Education*, 4(2), 215-235.

Falconer, I., & Littlejohn, A. (2007). Designing for blended learning, sharing and reuse. *Journal of Further and Higher Education*, 31(1), 41-52.

Fink, L. D. (2013). *Creating significant learning experiences: An integrated approach to designing college courses.* John Wiley & Sons.

Flipped Classroom Field Guide. (n.d.). Available at http://www.cvm.umn.edu/facstaff/prod/groups/cvm/@pub/@cvm/@facstaff/documents/contect/cvm_contect_454476.pdf

Graham, M., & Scarborough, H. (2001). Enhancing the learning environment for distance education students. *Distance Education*, 22(2), 232-244.

Gupta, A., Mau, R. R., & Richardson, T. M. (2014). Assessment of an online management science course. *International Journal of Information and Operations Management Education*, 5(4), 376-402.

Hanover Research Council. (2009). *Best practices in online teaching strategies.* Washington, D.C.. Available at http://uwec.edu/AcadAff/resources/edtech/upload/Best-Practices-in-Online-Teaching-Strategies-Membership.pdf

Keengwe, J., & Kidd, T. T. (2010). Towards best practices in online learning and teaching in higher education. *MERLOT Journal of Online Learning and Teaching*, 6(2), 533-541.

Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31(1), 30-43.

Levine, A. (2015). Time is right for colleges to shift from assembly-line education. *Chronicle of Higher Education.* September 14.

Mashaw, B. (2012). A model for measuring effectiveness of an online course. Decision Sciences Journal of Innovative Education, 10(2), 189-221.

Nemanich, L., Banks, M., & Vera, D. (2009). Enhancing knowledge transfer in classroom versus online settings: The interplay among instructor, student, content, and context. *Decision Sciences Journal of Innovative Education*, 7(1), 123-148.

Redpath, L. (2012). Confronting the bias against on-line learning in management education. *Academy of Management Learning & Education*, 11(1), 125-140.

Reisner, J. (2015). *AFIT EN DL Instructor Orientation* [online course content]. Available at https://afit.blackboard.com

Smith, M. A., & Kellogg, D. L. (2015). Required collaborative work in online courses: A predictive modeling approach. *Decision Sciences Journal of Innovative Education*, 13(4), 563-581.

Strakos, J. K. (2016). Using spreadsheet modeling to teach exchange curves (optimal policy curves) in inventory management. *Decision Sciences Journal of Innovative Education*, 14(1), 51-66.

Wexler, E. (2015). Can online education help refugees earn degrees? *Chronicle of Higher Education Wired Campus Web log.* October 5. Available at

http://chronicle.com/blogs/wiredcampus/can-online-education-help-refugees-earn-degrees/57456.