

Adaptation of a Construction Management Program to Online Delivery

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The use of technology in higher education and the advancement of virtual technologies are redefining the way in which education is viewed and delivered. Virtual classrooms are being used by colleges and universities all over the world with two key factors driving this phenomenon. First, there has been a significant shift in the average age of college students and, as a result, the work schedules and life responsibilities held by these non-traditional students. Second, research evidence supports learning effectiveness through various elements of online delivery where students taking courses online are performing better, on average, than students studying the same material in a traditional face-to-face environment. One challenge that must be met, central to this study, is finding a means for ensuring course rigor is not compromised with online delivery. This study introduces readers to an online course development framework in support of converting courses in a construction management program to online delivery. This study can be viewed as ongoing in nature in providing construction management students and working professionals with an alternative option to take classes in their program online towards their degree completion. The online course development framework encompasses university, program, student learning outcomes, and a course construction platform braced by a uniform grading analysis worksheet in support of measured academic rigor.

Keywords: University Student Outcomes, Virtual Classroom, Program Student Outcomes, Uniform Grading, and Academic Rigor.

Introduction

Distance learning has been on the minds of educators and administrations for years. The styles of distance learning have grown, along with the demand for more classes that utilize the technology we have gained with the development of the Internet. A study done by Chronicle Research Services found that "students now in elementary school are going to expect more connectivity and creativity from colleges" (p. 4). Studies have been done for years trying to find the benefits in online learning for students and universities alike, and the results are strikingly positive. The world of education is changing and the universities will need to adapt as well to fulfill the expectations of their students. This study draws from an applied application where a Bachelor of Science in Construction Management program announced to offer 50% of their program courses online within a two year period. This implementation will allow Construction Management students to take general education, business, construction and engineering related courses online towards their degree completion. The rational in support of this announcement was to provide students with a more flexible lecture platform and to attract nontraditional students to the program. The University's Online and Professional Studies (OPS) division currently offers various undergraduate and graduate degree programs online and is supported by a well-documented course development process that is intended to preserve academic rigor. The Construction Management department worked closely with the OPS division in support of their online course development initiative. Construction Management students are currently able to complete 48% of their degree requirements (courses) online. Additional conversion of three construction engineering and management courses will allow students to complete 50% of their degree requirements online as stipulate following.

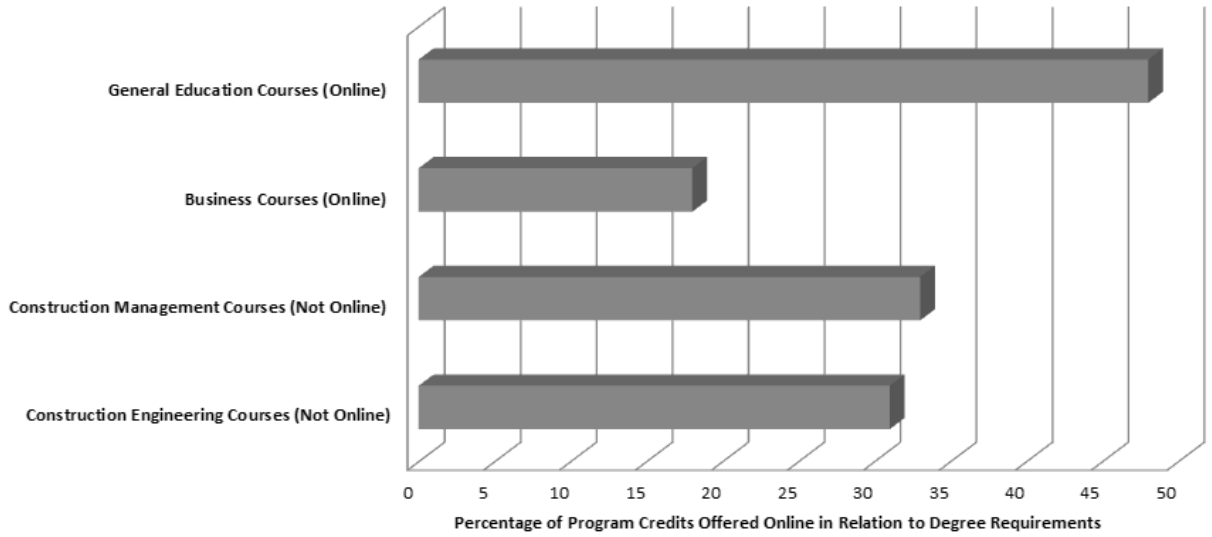

Figure1: Breakdown of program courses credits currently offered online. Students can take 48 general education credits online and well as 18 credits of business courses.

Literature Review

As distance learning has developed and evolved, there have been various definitions of "online learning". Traditional classes held on campus at designated times are considered "synchronous" courses. Contrarily, "asynchronous" courses are generally described as any computer-mediated course with no set time or place for students and instructors to meet. Though the specific definition of asynchronous courses differs amongst researchers and educators, the basic description is the same. These courses can vary with the use of any type of web-based instruction tools like e-mail, asynchronous chat platforms, and even education platforms such as Blackboard.

Chickering and Ehrmann (1996) stated that, "if the power of new technologies is to be fully realized, they should be employed in ways consistent with the seven principles" (p. 3). Those principles state that good instructional practice encourages student-faculty contact, encourages cooperation among students, encourages active learning, gives prompt feedback, emphasizes time on task, communicates high expectations, and respects diverse talents and ways of learning (Chickering and Reisser, 1993). In a study by Stan G. Guidera (2000) on faculty perceptions of the effectiveness of online teaching based on experience in both traditional and online courses, he looked at those seven principles of good practice in higher education. Developed at the Wingspread Conference in 1986 by researchers led by Chickering and Gamson, these principles are now used regularly as an assessment tool for new practices in higher education (Millis, 1991).

Chickering and Ehrmann (1996) found positive results for each in-depth look at the seven principles in online learning, stating that, "teaching strategies that help students learn at home or work can save hours otherwise spend commuting to and from campus" (p. 5). Active learning techniques are used when students utilize the Internet for research projects that assist in fostering a deeper understanding of topics and feedback through online coursework is swift due to the ability to e-mail. Chickering and Ehrmann (1996) also stated that, "a clear advantage of email for today's busy commuting students is that it opens up communication among classmates even when they are not physically together" (p. 4). They also claimed, "total communication increases and, for many students, the result seems more intimate, protected, and convenient than the more intimidating demands of face-to-face communication with faculty" (p. 4). The final, and perhaps most important of the seven principles is the respect of differing talents and styles of learning. Harasim, Hiltz, Teles, and Turoff (1995) said of asynchronous courses, "all students, regardless of ability, benefit from the opportunity to self-pace activities, whereby they can explore issues and insights about a topic of interest more deeply" (p. 195).

Although the application of the seven principles of good practice in higher education fared well in their application to asynchronous online learning, Harasim et al. (1995) state, "a fundamental question for educators is how educational applications of new on-line environments may improve learning" (p. 39). Some reviewers suggest that online learning practiced in the 21st century will be able to perform better than earlier forms of distance education in terms of the effects it has on learning (Zhao, J. Lei, B. Yan, C. Lai, and H.S. Tan 2005). In addition, "In recent

experimental and quasi-experimental studies contrasting blends of online and face-to-face instruction with conventional face-to-face classes, blended instruction has been more effective, providing a rationale for the effort required to design and implement blended approaches. When used by itself, online learning appears to be as effective as conventional classroom instruction, but not more so" (Means, B., Toyama, Y., Murphy, R., Bakia, M., Jones, K., 2010, p. xviii).

The claim that a lack of time in front of a professor or around other students will negatively affect students has been found to be inaccurate by multiple researchers. Pascarella and Terenzini (1991) have found that "the frequency of non-class contact with faculty to discuss intellectual matters had a statistically significant positive association with reported gains in intellectual development" (p. 149). It has been said that students who speak English as a second language or are simply shy are more likely to participate in online class bulletin boards and other text-based interactions (Powers & Mitchell, 1997; Sugar & Bonk, 1995). Online coursework also puts a larger emphasis on writing and analytical skills, and Harasim (1990) proposed that "the need to verbalize all aspects of interaction within the text-based environment can enhance such metacognitive skills as self-reflection and revision in learning" (p. 49). Harasim et al. (1995) also states that "the depth of discussion online far exceeds what is possible in face-to-face classrooms" (p. 224), and due to their asynchronous nature, "online discussions can cover more ground with greater depth of analysis because the online classroom is typically always open" (p. 224).

Methodology

This study draws from an applied application as a Bachelor of Science in Construction Management program plans to offer 50% of their courses online over a two year period. This initiative will allow Construction Management students to take general education and business courses online, which, if successfully completed, will pave the way to converting traditional construction and engineering courses to online modules. The initial step was to approach the University's Online and Professional Study (OPS) division which was established to respond to the very different needs of the non-traditional student that balances professional and family responsibilities while advancing their education. The OPS online and hybrid programs have been specifically tailored to meet these unique needs. The Construction Management department decided to initially convert one construction course to the OPS online delivery platform. This course, Construction Law & Safety (Con 330), was converted to online delivery through the OPS three phase development sequence as outlined in Figure 2. The intention behind converting CON 330 to an online platform is to test its convertibility as a non-technical construction course for online delivery. The successful launching of Con 330 as an online course will permit for additional CM courses to be converted.

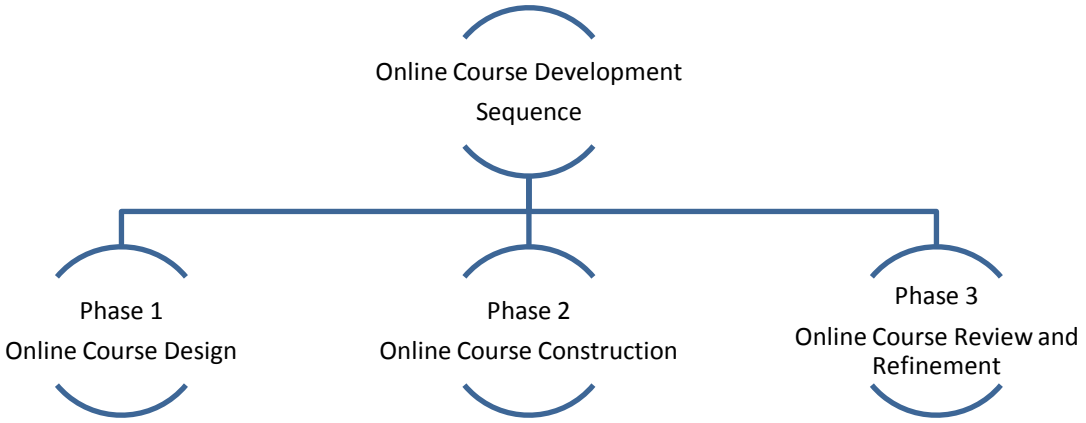

Figure 2: Online course development sequence.

Phase 1: Course Design

This phase addressed course design elements such as situational factors, learning goals and objectives, assessment procedures, and teaching and learning activities. Ultimately, this phase documented the alignment of each of the aforementioned elements within a course design worksheet and syllabus. Using the course design worksheet, partially illustrated in Table 1, faculty members outline a detailed structure for the course and substantiate alignment among the course goals, objectives, student learning outcomes, and university student outcomes. The listed course goals stem from the American Council of Construction Education's (ACCE) matrix where the objectives are unique to each course in support of its topical content. Each objective is aligned against student learning and university student outcomes as put forth by the program and university at large. A listing of the student learning outcomes (SLO) are not included in this paper due to its lengthy nature; however, the following listing is representative of university student outcomes as categorized under the USO** tap in Table 1. Academically Prepared (AP); Biblically Rooted (BR); Globally Minded (GM); Equipped to Serve (ES). This structure provides a means for evaluating the effectiveness of learning activities in meeting course level outcomes, student learning outcomes (program level), and university student outcomes (USO) at the university level.

Table 1

Partial view of a course design worksheet aligning program goals and course objectives with student learning outcomes and university student outcomes.

Goal 1: Introduce Students to National and Local Labor Laws (ACCE: 5.44)	**SLO***	**USO****
Objective 1.1: Students will be able to interpret National labor laws as it pertains to the built environment.	1.8	AP,GM
Objective 1.2: Students will be able to interpret California labor laws as it relates the built environment.	1.8	AP
Goal 2: Introduce Students to Administrative Procedures to Avoid Disputes (ACCE: 5.45)		
Objective 2.1: Students will be able to narrate and select administrative procedures in writing a safety plan outline in support of avoiding disputes.	3.3	ES
Goal 3: Introduce Students to Construction Safe Practices (ACCE: 5.51)		
Objective 3.1: Students will obtain their 30 hour safety training certificate/designation in support of Construction safety practices.		ES
Goal 4: Introduce Students to Compliance, Inspection, and Penalties (ACCE: 5.53)	1.8	
Objective 4.1: Students will obtain their 30 hour safety training certificate/designation in support of safety compliance, inspection, and penalties.		ES

Phase 2: Course Construction

Phase two involved course construction in the learning management system and the development of critical assignment grading rubrics. These rubrics are used for assessment purposes since they provide standardized templates to ensure consistency and enhance teaching and learning effectiveness. Each course goal is evaluated within a matrix framework as displayed in Table 2. The levels of competency ranging from exemplary, accomplished, developing, and beginning are consistent measurements as viewed from the online grading platform. The design of a grading rubric during the course construction phase not only provides an assessment continuum for each course goal, but also allows instructors to establish thorough course goal outcomes prior to teaching the course. Grading from the rubrics provides a consistent and standardized stream of data that can be interpreted and calibrated with increased reliability.

Table 2

Partial view of an online critical assignment grading rubric as drawn from the course design worksheet displayed in Table 1.

Performance Level	Exemplary (10) Points	Accomplished (8) Points	Developing (6) Points	Beginning (4) Points	Score
Goals 1: Introduce Students to National and Local Labor Laws (ACCE: 5.44)	Student accurately cites 3 OSHA standards from the 29 CFR OHSA Regulations handbook as instructed for each week. Each standard should be linked to an OSHA page number. Paper reflects no (0) mistake in support of grammar, spelling and referencing.	Student accurately cites 3 OSHA standards from the 29 CFR OHSA Regulations handbook as instructed for each week. Each standard should be linked to an OSHA page numbers. Paper reflects (1) mistake in support of grammar, spelling and referencing.	Student accurately cites 3 OSHA standards from the 29 CFR OHSA Regulations handbook as instructed for each week. Each standard should be linked to an OSHA page numbers. Paper reflects (2) mistakes in support of grammar, spelling and referencing.	Student accurately cites 3 OSHA standards from the 29 CFR OHSA Regulations handbook as instructed for each week. Each standard should be linked to OSHA page numbers. Paper reflects more than (3+) mistakes in support of grammar, spelling and referencing.	

Phase 3: Course Review and Refinement

Phase three involved the review and analysis of quantitative data from critical assignments as drawn from the course grading rubrics. The critical assignment rubric provided assessment data across multiple dimensions that aligned with student learning outcomes, at the program level, and course level objectives. Course CON 330, has not been taught online; therefore, no data is available on its program level outcomes or course level objectives. The provided data in Table 3 stems from an online business course that construction management students took during the summer of 2012. The case in point data analysis report displayed in Table 3, reveal areas of strength and those in need of improvement for each dimension. The points possible, grade distribution, and descriptive statistics provide an overview of performance which can be used for comparative purposes by course, section, instructor, and various student populations. This data can then be used to evaluate the degree to which student learning outcomes and course level objectives are being met. Then a determination may be made regarding curriculum modifications for enhancing student learning and the teaching effectiveness of instructors. This analysis data worksheet is linked to each critical assignment rubric as introduced in Table 2. In addition the quantitative assessment results indicated exceptional student performance across all dimensions, which can be traced back to and aligned with course level objectives.

Table 3

Online analysis data worksheet in support of course refinement.

		Frequency Distribution (Grading)				**Statistics Report (Scores)**			
Dimensions	Points possible	Exemplary (10) Points	Accompli-shed (8) Points	Developing (6) Points	Beginning (4) Points	Average	Median	Mode	Std. Deviation

Background	30	100%	0%	0%	0%	19.50	19.50	19.50	0.00
Core Problem	20	93%	7%	0%	0%	12.72	13.00	13.00	1.04
Secondary Problem	20	64%	29%	7%	0%	11.24	13.00	13.00	2.77
Alternate Solution	20	79%	7%	14%	0%	11.42	13.00	13.00	3.35
Constraints	20	79%	21%	0%	0%	12.16	13.00	13.00	1.66
Best Solution	30	79%	14%	0%	7%	17.41	19.50	19.50	4.93
Justification	20	79%	14%	7%	0%	11.79	13.00	13.00	2.67
Writing	20	86%	14%	0%	0%	12.44	13.00	13.00	1.42
APA	20	93%	7%	0%	0%	12.72	13.00	13.00	1.04

Dimensions that have less than 75% of students performing at the "Exemplary" level are marked for review to examine how the university may effectively help students successfully meet course objectives as well as program and university level outcomes. While there are many factors that may influence student performance and assessment results, the authors believe that the three phase design and development process significantly enhanced the overall learning experience and greatly helped to identify areas for improvement.

Conclusion

This study is ongoing in nature as it applies to converting courses in a construction management program to online modules. Many of the research done for online coursework and various styles of distance learning have returned favorable results. Students are able to learn at their own pace and to think more deeply about the topics they are learning. They can communicate clearly and quickly with instructors through email and other web-based platforms, and are even capable of having more thorough interactions with their peers through online discussions and forums. Although there are hundreds of ways online learning and asynchronous courses can be utilized, the general opinion from researchers is that, when done correctly, students can only benefit. McClure (1996) argued that "any institution that decided to opt out of support for information technology would be educating people to live in a world that no longer exists" (p. 29). In addition, calibration amongst faculty may enhance future course offerings by developing a clear and uniform understanding of grading practices. Since instructor expectations vary, calibrating grading practices as explained in phase 2 and 3 may decrease the negative impact of inconsistent grading practices as a variable and increase the effectiveness of trouble shooting and diagnostics. Limitations do exist as far as converting applied construction courses to online modules as viewed from a lab related platform; however, the majority of construction courses in this specific construction management program are not lab bound which include the following courses; Introduction to construction management, LEED and BIM integration, Construction law and safety, and Project delivery and contracts. The program anticipates converting these courses to online modules for virtual delivery after the successful launching of its first converted courses in the spring of 2015.

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