



Lessons Learned from Co-Developing and Co-Implementing a Design-Build Course with the Construction Industry

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The paper presents the results of a collaboration effort between the construction industry and faculty at a Construction Management program to co-develop and co-implement a Design-Build course that is cross-listed for undergraduate and graduate students. The primary goals of the course was to provide students the opportunity to increase their knowledge and understanding about Design-Build and learn the fundamental knowledge required for certification as a Designated Design Build Professional.TM The course was co-taught by two construction management faculty who are certified by the Design-Build Institute of America (DBIA) as Design-Build ProfessionalsTM and three industry members who are also Design-Build ProfessionalsTM and have current experience working on Design-Build projects. The course included lectures, individual and group hands-on exercises, and attendance to the DBIA regional conference. Students enrolled in the course completed the following core courses “Fundamentals of Project Delivery”, “Principles of Design-Build Project Delivery” and “Post-Award Project Delivery” which are required to obtain the Design-Build Professional TM designation.

Attendance at lectures taught by industry leaders was a required component of the course for enrolled students, but these lectures were also open to all students in the university as well as to the general community. Attending the DBIA regional conference allowed students to interact with architects, engineers, builders, design-build professional and owners. The secondary goal of the course was to enhance faculty knowledge and teaching excellence in the design-build arena by allowing faculty to participate in the DBIA regional annual conference and collaborate with industry to develop exercises and materials for the design-build course. At the end of the course students completed a survey to investigate their perceptions about the course and areas of improvement. The faculty and industry leaders reported that they enjoyed working together to co-develop and co-implement the course. One of the instructors was an architect and the other was a civil engineer. One of the industry collaborators was an architect, another was a preconstruction consultant, and another was an upper level construction operations manager. There was agreement that the diverse backgrounds of the educators/presenters brought different perspectives to the content, which facilitated student learning.

The results of the course survey indicate that students enjoyed the course and achieved the learning objectives for fundamental knowledge of Design-Build. One hundred percent of students either agree or highly agree that having industry collaboration, industry leaders as speakers, and attending the DBIA regional conference adds value to the course and that they would recommend the course to other students enrolled in the program. All of the students who participated in the class expressed intent to pursue certification as a Design-Build Professional TM.

Introduction

Construction management curricula have traditionally been centered around Design-Bid-Build project delivery. In Design-Bid-Build, also known as the traditional project delivery method, the owner hires a designer who prepares the construction drawings and specifications. After the drawings and specifications are completed, interested contractors (builders) bid on the project and a winner is chosen¹. In order to prepare students for the construction industry in the XXI century where alternative project delivery is becoming increasingly popular, faculty in the Construction Management program at a large public university in the western U.S. decided to offer a technical elective titled “Design-Build Contracting”. Design-Build project delivery is widely used among both public and private owners, particularly for complex projects. Owners are selecting Design-Build project delivery because it furnishes a single contract for both the design and the construction of a project, which results in a single point of responsibility for costs and delays associated with both design and construction problems⁵. According to RCD/RSMMeans, forty percent of non-residential US construction was awarded using Design-Build. The percentage of project awarded using Design-Build is expected to continue to steadily⁷. Design-Build is the preferred delivery system for many types of publicly procured projects, including military medical facilities in the Base Realignment and Closure program⁶. Construction is a vital aspect of the design process and there are increasing calls to integrated construction into architectural education².

The primary goals of the course was to provide students the opportunity to increase their knowledge and understanding about Design-Build and learn the fundamental knowledge required for certification as a Designated Design Build Professional.TM The course was co-taught by two construction management faculty who are certified by the Design-Build Institute of America (DBIA) as Design-Build ProfessionalsTM and three industry members who are also Design-Build ProfessionalsTM and have current experience working on Design-Build projects. The secondary goal was to co-develop and co-implement the Design-Build course as a collaborative effort between the construction industry and faculty at a university Construction Management program to increase faculty knowledge and teaching excellence in Design-Build by working with the industry professionals who work on Design-Build projects on a daily basis. Another goal of the course was to increase internal collaboration with other departments and interdisciplinary initiatives including increasing awareness about Design-Build from students in other departments such as interior design, business and engineering. Interdisciplinary initiatives and interdisciplinary participation in the course was particularly important to mirror how teams in Design-Build projects work, where multiple parties such as architects, engineers, contractors, marketing professionals, among others, collaborate towards the common goal of winning and executing Design-Built project.

Program Development

The Design-Build technical elective was a 2 credit hour evening course (30 contact hours). The mode of instruction and delivery included lectures, class activities, exercises and case studies. As shown in Table 1, students enrolled in the course completed three of the core DBIA courses required to obtain Associate DBIA certification: Fundamentals of Project Delivery, Principles of Design-Build Project Delivery and Post-Award Design-Build Project Delivery³. Fundamentals of

Project Delivery “provides a general overview of the attributes of all the major project delivery systems, procurement methodologies and contracting approaches”, Principles of Design-Build Project Delivery “addresses the use of design-build as a project delivery method, focusing on essential concepts and characteristics, as well as critical elements of the RFQ/RFP process and overall project management”, and Post-Award Design-Build Project Delivery “provide[s] an overview of the construction and design-build contract management processes that are important as the construction phase ramps up”³.

The course also included guest speaker presentations by industry leaders and attendance to the DBIA Rocky Mountain Chapter Annual Conference in Denver, CO, to learn about Design-Build and network with Design-Build professionals and public and private owners.

Table 1: Design-Build Course Outline

Topic	Contact Hours
Fundamentals of Project Delivery	6
Lecture by DBIA Industry Leader	2
Principles of Design-Build Project Delivery	8
Lecture by DBIA Industry Leader	2
Lecture by DBIA Industry Leader	2
Post-Award Design-Build Project Delivery	8
Course wrap-up	2
Total	30

Attendance at guest lectures during the class period was a required component for enrolled students, but these lectures were open to all students in the university as well as to the general community. Attendees not enrolled in the course at guest presentations were mainly from the Department of Construction Management, the School of Engineering, the Business School, and the Department of Interior Design. In addition, facilities management employees also benefited from attending since the university has several design-build projects in its portfolio.

Design and Construction Industry Collaboration

The course instructors partnered with DBIA Rocky Mountain Chapter members and invited them to be guest speakers in the design-build course. Three guest speakers participated in the course, all three guest speakers have extensive experience working in the Design-Build industry and have prominent positions at top Design-Build companies.

The two faculty and three industry professionals who co-developed and co-implemented the course met several times during the semester prior to when the course was offered to discuss the course development and class schedule. The industry professionals participated as guest lecturers and presented the following topics: The first guest speaker gave a presentation about Design-Build schedules and the risk associated with them. He also discussed the risk shift for the owners when they switch from Design-Bid-Build to Design-Build or Construction Management at Risk and the risk shift between the Design Builder and Design-Build subcontractors. The second guest speaker presented the first half of the “Design Management Guide for the Design-Build Environment” and provided copies of the guide free of charge to the students. The third guest speaker presented the second half of the Design Management Guide.

DBIA Regional Conference

The theme of the Rocky Mountain Chapter Annual Conference was “Design-Build - Cultivating Your Toolbox”. The conference was a daylong event with five education tracks, a luncheon keynote speaker, and concluded with a reception. The students enjoyed attending the conference to increase their knowledge about design-build and to interact with the industry. The students wrote a reflection paper about their experience attending the conference.

Outcomes and Evaluation

Students completed a course-specific evaluation at the end of the semester. This evaluation was in addition to the standard university course evaluation given at the end of the semester. The eight students who were enrolled in the course completed the evaluation. The students reported that they were very satisfied with their course and their experience attending the DBIA Rocky Mountain Chapter Annual Conference. When the students were asked whether or not they would recommend this experience to other students, all students strongly agreed that they would recommend this course to their peers. When students were asked if they believed that the DBIA added value to the course, all students either agreed or strongly agreed that the guest speakers added value. This response is essential because it validates the importance of collaborating with the industry to enhance the educational experience of construction management students. When asked about the level and complexity of the course, seven students stated that the course level and complexity was right while one student taught that the course was too simple/ general. When asked about whether or not the students intend to pursue DBIA certification, all eight students replied that they intend to pursue certification. This shows that students are aware of the importance of having professional certifications to advance in their careers.

Table 2: Student Feedback Multiple-Choice Questions

	Strongly disagree	Slightly disagree	Neutral	Slightly agree	Strongly agree
I would recommend this course to other students	0	0	0	0	8
DBIA guest speakers added value to the course	0	0	0	1	7
	Too advanced		Too simple/general		The right level
Course level/complexity	0		1		7
	No		Yes		
Do you intend to pursue the DBIA certification?	0		8		

Students were asked two open-ended questions about their experience in the course. The first question asked about the aspects of the course that they liked or found most helpful. As it can be seen in table 3, several student stated that having two professors teaching the course was positive and that having guest speakers and attending the conference enhanced their learning experience. The second question asked about the aspects of the course that they disliked or found least helpful. As shown in table 3, the students believe that the course slides have room for improvement. The last section of the evaluation survey included space for students to provide comments. As it can be seen in table 3, the comments were overall positive and provided helpful feedback to improve the course.

Table 3: Student Feedback Open-Ended Questions

What aspects of the course did you like the best or find most helpful?	<ul style="list-style-type: none"> Professors had separate teaching styles that complemented each other to make a great environment that showed the value of design build and was very informative about IPD and the design build process. Depth and background from instructors. Guest speakers. Regional conference interface with practitioners. Experiential insight by both instructions and guest speakers The conference is good. Two instructors in one course is a good style. I thought this was an interesting class and really helped me understand the design build process a lot better. The guest speakers were informative- it was nice to hear from the industry and see examples of their project/challenges. Guest speakers and conference.
What aspects of the course did you dislike or find least helpful?	<ul style="list-style-type: none"> Some of the early material was super repetitive being a 400 level class. We know how DBB and CM/GE contractual relationships are. Some of the slides are redundant. The course should have a textbook for students to read. It would be nice to get more class oriented slide presentations that are geared towards a college class setting. I thought the slides were too basic and simple.
Comments:	<ul style="list-style-type: none"> Great class with many new planning and teaming strategies. Strongly needed course in today's CM environment. Well perceived as both a student and directly applicable as a professional. This course offered as combined DBIA certification workshop but lack one course (contracting risk

management). It will be better if it can include that missing course as well.

- I would like this class to include the risk section and more cases with class discussing.
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Conclusions and Lessons Learned

The results of the course evaluation survey indicate that students enjoyed the course and achieved the learning objectives for fundamental knowledge about Design-Build. One hundred percent of students either agree or highly agree that having industry collaboration, industry leaders as speakers and attending the DBIA regional conference added value to the course and that they would recommend the course to other students enrolled in the program. All of the students who participated in the class expressed intent to pursue certification as a Design-Build Professional™. One of the most important lessons learned during the development of the Design-Build program is that collaboration with industry professionals and attendance to a conference where students have the opportunity to learn up-to-date practices and interact with professionals greatly enhances the learning experience. It was helpful to work with industry professionals at different companies to diversify the course experience and provide the students a variety of perspectives that they would not ordinarily get in a traditional course. Attendance to the DBIA Rocky Mountain Chapter Annual Conference required additional planning but opened students' eyes to the opportunities in the Design-Built environment.

One important aspect that contributed to course success and faculty engagement was the provision of funds and teaching resources from the DBIA national offices. Because the course was taught by DBIA Designated Professionals, DBIA made their teaching resources available to the faculty to use in the delivery of the course. The teaching resources are identical to those used in the DBIA Continuing Education program for practicing professionals desiring certification as a DBIA Designated Professional™. In addition to the teaching resources provided by the DBIA National Office, the Rocky Mountain Chapter provided support for students to attend the Annual Conference in Denver. The Charles Pankow Foundation, a key strategic partner of DBIA, provided additional funding to cover some nominal course development costs.

Because the test bank of questions used in the DBIA Designation exam is confidential, one of the issues that had to be addressed was the development of assessment questions to demonstrate mastery of the content. The reflective papers, case studies, and in-class exercises were appropriate and useful academic assessment tools, but they were not well-suited for preparing students to take the national DBIA Designation Exam upon graduation. To address this, the instructors turned to faculty at other universities who had taught similar classes at their universities. The Academia and Student Outreach Committee of DBIA provides access to a small but tight-knit group of faculty who share a common interest in developing design-build curricular offerings. These faculty share their ideas and in this case, provided samples of their exam assessment questions.

The Design-Build course was the result of a collaboration that is unique in academic settings. The course involved contributions from industry, a national professional institute, a regional

professional institute, a not-for-profit funding organization, faculty at other universities, and other departments within the universities. These types of multiple-partner collaborations with multiple funding sources are increasingly common in the design and construction industry (Gransberg, et al, 2013) but are rare in academic settings. The evidence suggests they provide great benefit to students and opportunities exist in a variety of academic content areas (sustainability, virtual design and construction) to develop similar course structures.

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