Developing and Teaching a Collaborative Design and Construction Administration Course

Richard C. Ryan, MSCS, AIC, CPC and Marjorie P. Callahan, AIA, LEED AP
University of Oklahoma
Norman, Oklahoma

A collaboration based Design and Construction Administration course was offered for the first time at the University of Oklahoma Fall 2006. Students from the Division of Architecture Project Management and Division of Construction Science Construction Administration courses were consolidated into a single required integrated course called Design and Construction Administration. The objective is to present and explore collaborative motives, agendas, responsibilities and outcomes between designers and contractors. A survey was used to gather feedback about the effectiveness of the teaching methods discussed in this article. Based on survey results the authors are optimistic about the possibilities of this course and its objectives. As construction project timelines shrink, designs become more complex and the market becomes more competitive success becomes more dependent on collaboration between designers and contractors. The authors believe this collaborative approach for developing and teaching a class focused on the business of design and construction can be replicated by other academic architecture and construction programs. Increasing student awareness of design and construction administration challenges is timely and hopefully will lead to better adjusted industry participants.

Keywords: Architecture, Collaboration, Construction Administration, Construction Science, Design Administration.

Introduction

A collaboration based Design and Construction Administration course was offered for the first time at the University of Oklahoma (OU) Fall 2006. Fifty students from the Division of Architecture (ARCH) Project Management and forty-five students from the Division of Construction Science (CNS) Construction Administration courses were consolidated into a single required integrated course called Design and Construction Administration. The objective is to present and explore collaborative motives, agendas, responsibilities and outcomes between designers and contractors.

The course is designed to openly explore the traditionally contentious designer/contractor relationship. Lecture emphasis is on the business relationships required between owners, designers and contractors. Many times lectures are crafted to address typical industry challenges and the required collaboration to complete related problem solving exercises. The approach also includes strong emphasis on effective communication. Interdisciplinary efforts are designed to promote recognition of the need and dependence on communication. By presenting and exploring motives, responsibilities and outcomes, it is hoped that young architects and contractors will better glimpse the challenges inherent to design and construction. Course objectives and activities are crafted to keep disciplines clearly identifiable at all times, yet theories and methods are applied across disciplines so that they are no longer associated with a single discipline or field.

This article discusses development of the Design and Construction Administration course, innovative teaching methods used in the delivery, student ratings of the effectiveness of the teaching methods and observations based on these results and the collaborative experience. It is hoped that the following discussion can be used by other design and construction programs to examine their approach to classroom integration and promotion of design and construction administration collaboration.

Uniqueness of Approach

The authors consider requiring class participants from traditionally hostile disciplines to collaborate a unique approach to teaching. Based on the authors' experience and assessment, academic collaboration between architecture and construction students related to the business of design and construction has been limited to date. "Both the needs and opportunities for collaboration between design and construction academic disciplines to exist as a staple in higher education have been identified; however, capitalization of the opportunities appears to have been all but avoided" (Holley and Dagg, 2006). Often the two academic disciplines are housed in separate colleges. Even when the two are in the same college and occupy the same building, courses are rarely blended to mutually present and explore shared industry perceptions, stereotypes, insights and frustrations. Development of a course focusing on the collaboration and communication required for success in the business of design and construction is a seminal step for the OU College of Architecture and construction education in general. To date most courses comprised of both architecture and construction students are technically oriented (structures, mechanics or systems), project-based (design and build) or general information classes (history, art or drawing). Other than in the project-based format, typically no real interaction is required between the two disciplines.

Course Objectives

The following course objectives were identified early in the development process by the two authors. Identification helped define issues and ultimate course direction.

- Collaboration and communication are the focus of class content, activities and delivery.
- Exercises and homework require the two disciplines to work together to address and solve problems. It is hoped that this creates a unique opportunity for student-led, learner-centered, team exploration of many issues that plague the design and construction industries. By raising awareness and encouraging collaboration, students are forced to explore preconceived attitudes regarding designer/contractor relationships.
- Industry leaders are to be used to help explore and explain topics requiring collaboration. The Design and Construction Administration class was designated one of two 2006 University of Oklahoma "Dream Courses" spring semester of 2006. The designation and grant was started by the university the previous year. Selection included a $20,000 grant from the university

president to be used for honorariums and expenses to host speakers from outside the institution. This was a very notable designation by the university community. The grant is competitively awarded based on proposal submission. The grant was to be used to present members of industry "doing something you aspire to do or an insight of your profession from another perspective……It solidifies your sense of why your field is important or why the kind of job you aspire to have is worth continuing to struggle toward." (Moakley, 2005) Focus of panel presentations is to reinforce the importance of collaboration between the project team. Such collaboration is directly related to project success, regardless of the project size, type or dollar volume. As stated in the Sooner Magazine "the cross-pollination of ideas……opens up whole new options" (Moakley, 2005).

- Both authors are present during class lectures. Lectures are led by one professor, but supplemental comments are welcome from the other. Faculty lead discussion by example. It is hoped that students, simply by sitting in class, gain insight by watching and listening to the two mentoring professors respectfully communicate with each other. Professors use the opportunity to spontaneously and constructively express their many times differing thoughts or perspectives during the "give and take" of class lecture.

Issues

The authors recognized the challenges presented by the course objectives and considered the following issues during development.

- The class is not only composed of different disciplines from the College, but also students at different stages of their academic careers. Class members include ten graduate Landscape Architect (LA) students (typically from undergraduate disciplines other than Architecture), forty fifth year ARCH students (final year of professional accredited program) and forty-four third year CNS students (junior year of four year accredited program).

- Faculty chose to ignore student differences and require all to work equally on integrated teams to do activities, exercises and homework assignments. Integrated work teams were assigned the first day of class. Design students lined up on one side of the class room and construction students lined up on the other. As each person came to the front of their respective line they were united with a person from the other discipline. Work is designed to promote a self-teaching approach using exploration of differing perspectives by team members.

- The approach and dynamic of team teaching the new course was untested. During course development faculty were getting to know about each other's backgrounds, perspectives, teaching approaches and ultimate class goals.

- The dual lecture approach was untested and placed great emphasis on the role, behavior and delivery of the respective professors.

- Both professors had previously taught the respective courses in their own departments. However, the large class size and subsequent large class room required were substantially different from any previous courses taught. It was, therefore, necessary to reconsider the teaching approach and methods previously used for smaller classes.

- It was assumed that guided dialogue and open discussion would benefit the class. However, due to the large class, individual student engagement is limited. New approaches needed to be incorporated into the class format for engaging students during class periods.

- Meeting national accreditation requirements for both academic programs by meshing material previously contained in two classes forced faculty to effectively and efficiently organize class content. To aid with this, two columns were added to the class syllabus noting the pertinent section number for each discipline's accreditation requirements. To review the class syllabus go to **http://cns.ou.edu/desconadminclass/syllabus.htm**.

- Due to the once a week, three hour class meeting format, the amount, sequence and pace of information delivery was carefully considered. Lectures and activities were outlined in a weekly agenda included in a student-purchased course packet. The agenda divided the class into three or four sessions for each class meeting. Each class was comprised of a lecture by a specified faculty member, an in-class activity, a break if appropriate and another lecture session. Efficient use of class time was viewed as critical to cover all syllabus content.

- A course packet containing contributions from both professors was to be the primary resource. It was organized and tabbed by week. It was to be purchased at a designated copy service by class participants.

- Panel presentations were scheduled every five weeks to break up the lecture format. Part of each panel focus was content covered during the previous five weeks.

Innovative Teaching Methods Used

The authors recognized during initial development that there was great opportunity to incorporate less traditional and more innovative teaching and learning mechanisms into the course format. This was treated as a great strength and benefit from the start. The following are teaching methods that the authors considered less traditional and innovative.

Professors as Role Models: Two professors from different disciplines collaborating to create the best possible class experience was viewed as a primary mechanism for demonstrating successful collaboration and leading by example. Behavior, attitude, demeanor and experiences displayed before the students during each class set a "collaborative example"; even when the discussion topic was controversial or perspectives differ greatly. Faculty roles were further challenged by the amount of communication required on a weekly basis to organize and deliver classes.

Use of Industry Panels: The dream course designation encompassed several related perspectives. The authors envisioned the "dream" as an opportunity to address and explore design and

construction discipline collaboration in an integrated classroom setting. For the College of Architecture it was an opportunity to get great return on faculty initiated effort for little resource increase or change. Course contents overlapped to create a cohesive manageable syllabus. It was a "dream" opportunity for students to greatly expand the traditional education experience by meeting and interacting with high profile proven industry leaders.

In place of inviting individual speakers, it was decided that a panel format would be used due to the collaboration emphasis of the course. Panels comprised of project Owner, Designer, Consultant and Contractor representatives presented to the class at weeks five, ten and fifteen of the semester. Panel presentations were announced to the college, university and public. Emphasis was not on the project design or construction, but the collaboration required to make them happen. The project was to be used as the backdrop for discussion. Panelists addressed a series of guiding questions focusing on collaborative issues relative to course content. Proposed questions also focused on the type, level and quality of communication required. Three projects were targeted as panel backdrops. Selection was based on class content suitability, project design, construction characteristics, delivery and dollar volume.

Figure1 is the poster designed to promote the Dream Course. Each panel focus, project and dollar volume are listed below.

- Panel 1: "Collaboration: Pride and Duty – The Oklahoma City National Memorial"; approximately $6 million.
- Panel 2: "Collaboration: Design Process and LEED Certification – The Fayetteville, AR Public Library"; approximately $24 million.
- Panel 3: "Collaboration: High Profile and Complex Architecture, Delivery and Budget – The Tulsa Convention Center"; approximately $225 million.

After each panel presentation attending class members were required to write and submit a one page summary highlighting key collaboration issues addressed during the presentation. Summaries were used to verify attendance and as the basis for review and recap at a future class meeting.

Figure 1: The 2006 OU Design and Construction Administration Dream Course Poster.

Development of Panel Questions: Making panel question development an incentive-based exercise provided a unique opportunity to promote team thinking about collaboration issues. Two weeks prior to each panel presentation, students were asked during class to prepare and submit a memo listing three possible questions relating to possible project collaboration. Teams submitting selected questions were invited to attend lunch with the panel at the University of Oklahoma Faculty Club on the day of the presentation.

Use of Multi-disciplinary Student Teams: Using activities, exercises and homework requiring multi-disciplinary teams to work together to find a solution or determine a course of action based on a dilemma is ideal for student centered learning. Along with other activities and homework a scheduled and limited time was used each class period requiring teams to compose a memo suggesting a course of action, recommendation or solution. The first memo required teams to characterize their "ideal client". Notably, design students were interested in the interests and involvement of the client, whereas construction students were interested in a financially sound client. Teams had to agree upon and prioritize desirable characteristics for this memo. Sometimes teams were spontaneously asked to present their findings or opinions in front of the class. Such an example is "Should an architect think through required construction equipment (such as lifting) as part of the design?"

Use of a Dress Code: In an effort to "professionalize" the class atmosphere "proper" attire was required at all class meetings - no caps or hats, "flip-flops", sleeveless shirts, ragged shorts, pants, shirts or other garments. Professional dress attire was required for panel presentations. Students not complying are asked to leave.

Use of AIA Documents On-Line: With the permission of the AIA, class participants were some of the first students and faculty in the country to access the AIA website to use the Student Edition to view and complete specified AIA Documents. Use greatly enhanced class content. Assignments required users to identify and edit particular contract articles based on various options offered, identified problems or areas of concern.

Use of Case Studies: Case studies acquired from a funded trip by one of the authors to study under Carl Sapers at the Harvard School of Design were used to add breadth to the course syllabus and assignments. Topics ranged from describing a change in a law to allow a controversial building project to proceed, to quality construction demonstrating the value of a good set of specs. The case studies presented controversial subject matter in a realistic atmosphere, rather than teaching particular faculty viewpoints. Case studies were assigned for reading prior to the respective lecture or pertinent panel presentation. Additionally, case study discussion shed light on how students perceived the articles differently.

The Teaching Methods Effectiveness Survey

The Survey and Data Collection

Appendix A: ARCH 5043/CNS 3113 Teaching Methods Survey was used to gather feedback about the effectiveness of the teaching methods discussed in this article. Eighty-three CNS, ARCH and LA students in the class rated the effectiveness of selected teaching methods using this scale: 5 = very effective; 4 = effective; 3 = somewhat effective; 2 = not effective;1 = do not know. The purpose of the survey was to gather feedback to maintain, improve or change the less familiar and untested teaching methods used by the authors in the class. The hard-copy survey was completed by attending class members and collected by the authors the last regular class meeting of the semester.

Questions 16, 17 and 18 were included because the authors were concerned about the possible negative effect on students that openly discussing common contentious problems between architects and contractors might have. The authors wanted to verify that highlighting problems of which some students were not aware, would not heighten any existing bias.

Survey Results

Table 1 reports the average effectiveness ratings for survey questions 1 through 13 by discipline (CNS and A/LA) and together (All). 38 CNS, 38 ARCH and 8 LA students completed the survey.

Table 1

Teaching Methods Effectiveness Survey Results

Question	Average Effectiveness Rating		
	CNS – 38 responses	**A/LA – 46 responses**	**All – 84 responses**
1	3.58	3.85	3.72
2	2.63	3.11	2.89
3	3.63	3.61	3.62
4	4.55	4.63	4.6
5	3.18	3.24	3.21
6	3.05	3.28	3.18
7	3.63	3.54	3.58
8	2.76	3.3	3.06
9	3.63	3.83	3.74
10	2.95	3.41	3.2
11	2.76	2.78	2.77
12	3.03	3.22	3.13
13	3.84	3.83	3.83

Table 2 reports the percentage of yes, no and alternate suggestion/no change responses for survey questions 14, 16, 17 and 18 by discipline and together (the percentage of all responses is reported in the right hand ALL column under each question). For instance, for Question 14, 45% of surveyed CNS students selected YES or felt the class should be offered in the same format again.

Table 2

Survey Questions 14, 16, 17 and 18 Results by Discipline

Response	Responses (%)											
	Question 14			**Question 16**			**Question 17**			**Question 18**		
	Discipline			**Discipline**			**Discipline**			**Discipline**		
	CNS	**A/LA**	**ALL**	**CNS**	**A/LA**	**ALL**	**CNS**	**A/LA**	**ALL**	**CNS**	**A/LA**	**ALL**
YES	45	61	54	81	80	80	38	9	22	8	14	11
NO	29	24	26	0	9	5	40	71	57	62	68	66
AS/NC	26	15	20	19	11	15	22	20	21	30	18	23

Observations

The authors have learned a substantial amount about each other, teaching, the disciplines and collaboration. The experience is much like the real professional working relationship required between the architect and contractor. For team teaching success the level of commitment and motivation must be consistent and equal, as is the design and construction of a real world project. Backgrounds, styles, bias, strengths and weaknesses have to be meshed and crafted. It requires dedicated work to succeed. The authors applied approximately 160 man-hours to class and resource development before the first class was taught. Once classes started, one to two hour coordination meetings were held each week prior to the class meeting. Faculty gained great insight from this effort concerning the similarities and differences of the respective fields. For

instance, presentation skill is valued in both disciplines and required from both accrediting bodies. This reinforced the need to incorporate these types of activities into the format.

Worth noting was the shift from team to individual assignments for the last three homework assignments (writing a RFI, Submittal, COP, CO and series of AIA pay applications). The authors recognized that most teams divided the work by discipline instead of working together. This somewhat minimized the effectiveness of the collaborative intent of most activities and reduced anticipated exploration of content. Due to the authors' desire for all students to explore all parts of assignments, the authors changed the submission requirements. Comments were made by several students about problems scheduling meetings, but these types of common issues were not a consideration in this decision.

Enforcement of the dress code was not an issue as students complied. Based on the 2.77 rating (Question 11) and related comments, the authors assume respondents viewed the requirement somewhat passively.

Average effectiveness ratings by discipline for questions 1 through 13 were similar, except for questions 2, 8 and 10. Overall effectiveness of teaching methods was consistently between somewhat effective and effective. Panel presentations (question 4) were rated the highest and considered very effective. Based on unsolicited and survey comments, the lower construction students' rating for Question 2 is attributed to a desire for more concise directed information, focused on a specific learning concept, not articles and general information. Based on unsolicited and survey comments, the lower construction students' rating for Question 8 was due to a desire to focus on construction contracts and documentation. Note that related exercises focused on contracts for both disciplines. The difference in rating for Question 10 reflects greater acceptance by design students to the use of case studies to explore concepts and ideas because of use in previous classes. Construction students perform limited activities using case studies.

Negative and alternate suggestion comments about the class format (question 14) primarily addressed the three-hour time block. Many suggested offering the class twice weekly. It is noted that design students typically have multiple hour studios and class meetings, perhaps lessoning their negative perception. There were a few comments about keeping the classes divided. The 80% yes response for question 16 "Did discussing issues/problems, that perhaps you were not aware existed, improve your understanding of the Architect and Contractor relationship?" is viewed as a strong endorsement of the lecture approach and faculty interaction. Responses of 78% and 89% no or no change for respective questions 17 and 18 were considered a strong endorsement of discussing and exploring controversial issues openly and fairly. Question 15 most effective comments overwhelmingly reinforced the strong rating for the panel presentations. Selected least effective comments include clashing teaching styles, random information delivery, smaller classes, two meeting times, study guide too long and too hard to coordinate team work. The authors feel many of these comments are reflected in the survey response percentages.

Conclusions

Based on the survey results authors are optimistic about the possibilities of this course and its objectives. More results concerning teaching methods effectiveness will be collected Fall 2007. Using results from the effectiveness surveys, teaching methods will be reviewed, revised or changed for the next fall offering. Authors recognize that activities and content must be balanced and communicated effectively to mutually hold the interest of both disciplines.
Perhaps the most notable finding of this effort was that the use of industry panels from actual construction projects is very effective for demonstrating and exploring collaboration between owners, designers and contractors. The overwhelming yes response for question 16 and the high effectiveness rating for panel presentations (Question 4) is viewed as a motivator for exploring direct and innovative ways of highlighting and discussing prevalent industry design and construction issues.

The success of this type of effort is greatly influenced by the attitude, motivation and commitment of the participating faculty. Numerous class participants remarked that the team teaching approach and open interdisciplinary collaboration helped in their comprehension of class content. The concentrated effort that went into the development and implementation of this course before the first class meeting must be emphasized. Though both authors received credit for teaching their regular class, the amount of work far exceeded that required if each had been teaching their respective class independently.

As construction project timelines shrink, designs become more complex and the market becomes more competitive, success will become more dependent on collaboration between designers and contractors. The authors believe the collaborative approach described in this article for developing and teaching a course focused on the business of design and construction can be replicated by other academic architecture and construction programs with similar courses and accreditation requirements. Increasing student awareness of design and construction administration challenges is timely and hopefully will lead to better adjusted industry participants.

References

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Appendix A: ARCH 5043/CNS 3113 Teaching Methods Survey

ARCH 5043/CNS 3113 Teaching Methods Survey **Dec. 05, 2006** **M. Callahan and R. Ryan**

Please use this scale to rate the **effectiveness** of the following teaching techniques or methods used in this class.

1 = do not know; **2 = not effective**; **3 = somewhat effective**; **4 = effective**; **5 = very effective**

1.	Both professors involved in lectures together.	**1 2 3 4 5**
2.	The study packet (the white three-ring notebook)	**1 2 3 4 5**
3.	Professors as role models for collaboration.	**1 2 3 4 5**
4.	Panel presentations.	**1 2 3 4 5**
5.	Student development of panel questions.	**1 2 3 4 5**
6.	Use of multi-disciplinary teams for homework and activities.	**1 2 3 4 5**
7.	Use of individual effort for homework and activities.	**1 2 3 4 5**
8.	Use of AIA Documents Online.	**1 2 3 4 5**
9.	Panel summaries.	**1 2 3 4 5**
10.	Case studies	**1 2 3 4 5**
11.	A dress code.	**1 2 3 4 5**
12.	Writing memos in class.	**1 2 3 4 5**
13.	Discussing openly problems/issues between Architects and Contractors.	**1 2 3 4 5**

14. Should this class be offered in the same format again (circle one)?

yes **no** **alternative suggestion**

In the space provided please very briefly explain the reason for your answer.

15. Describe (1) what was most effective and (2) what was least effective **for your learning** in this class?

16. Did discussing issues/problems, that perhaps you were not aware existed, **improve your understanding** of the Architect and Contractor relationship?

yes **no** **no change**

17. Did discussing issues/problems, that perhaps you were not aware existed, negatively **affect your perception** of Architects?

yes **no** **no change**

18. Did discussing issues/problems, that perhaps you were not aware existed, negatively **affect your perception** of Contractors?

yes **no** **no change**

Thank you.