

The Transformation of Teaching a Senior Level Construction Class

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As students are transitioning from academia to the professional world the responsibilities of educators is to ensure they receive the best possible experience that can be readily applicable. The goal was to increase the student's learning ability by transforming the traditional lecture style class to project driven class. The change was implemented in a senior level construction contracts administration class. Utilizing current project problems in relation to construction contracts topics gave the students an opportunity to solve today's issues and truly understanding the legal implications when a project goes bad. Construction programs must coordinate efforts with the industry they serve, both within the academic environment and the industry (Badger, 2000) (Tener, 1996). The industry participation was a critical factor in the new approach since their expertise was utilized. The industry participants agreed with the new teaching structure and found that the students were better prepared for their new careers. Student grades and instructor evaluations increased significantly. The results are from a previous study in which there has been indication of utilizing the industry projects to create a template for others to use in their classes. More research is being conducted to create a structure for other academic institutions to use this methodology.

Key Words: Education, Transformation, Project Oriented, Contracts, Industry Expertise

Introduction

The Construction Contracts Administration (CCA) class is a capstone class in construction management programs approved by the American Council of Construction Education (ACCE) accreditation. Construction contracts are the mechanism whereby construction contractors, owners who buy construction services and suppliers of materials interface. The lack of understanding a construction contract can be detrimental in the field, so this class is geared to prepare the students as young emerging professionals. In 2010, following challenges were noted:

1. The course was being treated as a singular senior level construction contracts module, not integrated with any of the other coursework or utilizing lessons learned from other classes.
2. The course did not have polished lecture presentations.
3. The majority of the students were not going to be construction lawyers, but construction company owners and construction project managers. They were interested in graduating, and not learning the importance of construction contracts.
4. It was difficult to engage the students in understanding the construction contract as a mechanism to enhance a project.
5. CCA senior level class was not motivating the students to fully utilize the associate faculty as industry legal experts.
6. Senior students were not able to articulate construction contract issues and their solutions with the traditional lecture approach of the class.

The class structure was not stimulating the students in an actionable way or preparing them for the construction industry as project managers, contractor representatives, and owners. The students needed a thirty thousand foot view, and also understand how the concepts integrate with the other construction management (CM) skills they learned from other CM classes. The students also needed a mechanism to improve the use of construction contracts.

Proposal

The new objective of the course was to provide the students a new learning structure that is more effective than the traditional learning structure of lecturing and exams (Korman, 2013). The professor proposed to integrate the CCA class with all the other construction management skills that were being taught to the students, as well as incorporating real life experiences by having the industry participate in the class and serve as mentors and experts. Another proposal of this effort was to change the student-faculty associate relationship from a teacher lecturing students, to future project managers utilize the legal expertise to resolve contractual issues.

Lastly, the new method had to be clear to identify how the future construction project managers can improve their environment by optimizing the contract. This paper will discuss the vision, class structure changes, different roles in the class, results, problems, and lessons learned.

Methodology

The new teaching model is based on 22 years of research on over 1750 projects with a success rate of 95% which utilizes expertise, minimizes risk, and increases performance; this is the longest running study at Del E. Webb School of Construction at Arizona State University (ASU); the class moved from an education approach to a research approach. The change focused from the instructor's knowledge to changing the student's work environment, and to change the industry environment by research testing instead of purely textbook education (Adeyemi et al., 2009). Providing such a relationship between public research organizations and the industry provides an important role in driving innovation processes (Perkmann, 2007).

Construction contracts have been plagued with problems for decades (Post 1998) in which most problems derive from "price-based" or "low-bid" environments (Kashiwagi, 2015). The Industry Structure was used in transforming this class because of early tests not only at other ASU classes, but in the industry national and international. The key critical element and driving force in transforming the CCA class was using the research as a driving force. The Industry Structure has four quadrants as shown in Figure 1. The two major quadrants are the value based and price based sectors; value based focuses on performance and expertise, while the other focuses on low price, management, direction, and control (Kashiwagi, 2015). In the same way, the existing contract management course is working with a price based mentality where the contractor is reactionary (Adeyemi et al., 2009), but through industry exposure and expertise of the lawyers, the class can move to a value based environment where the students/future construction professionals minimizes problems. The students become proactive instead of reactive and become the change driver of the environment they are working in (Kashiwagi, 2015). This transition is visualized in the Construction Contracts Administration Structure quadrants (Figure 2).

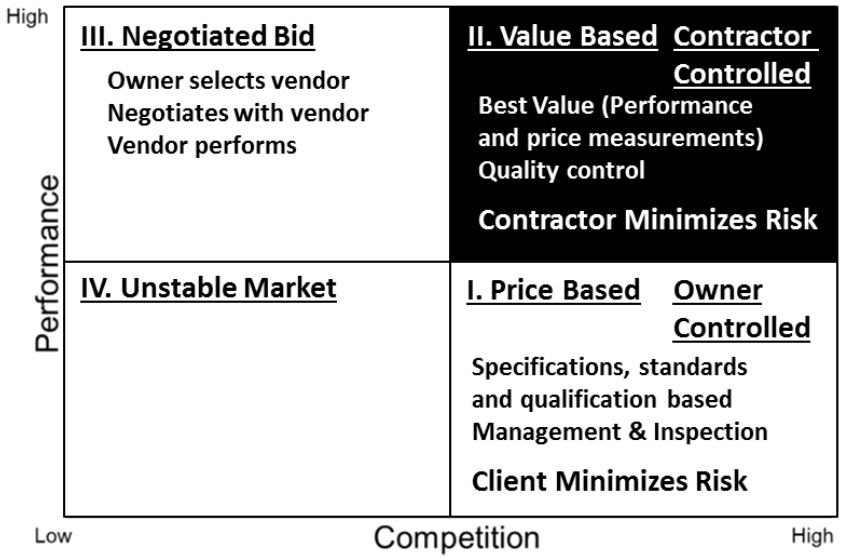

Figure 4: The Industry Structure

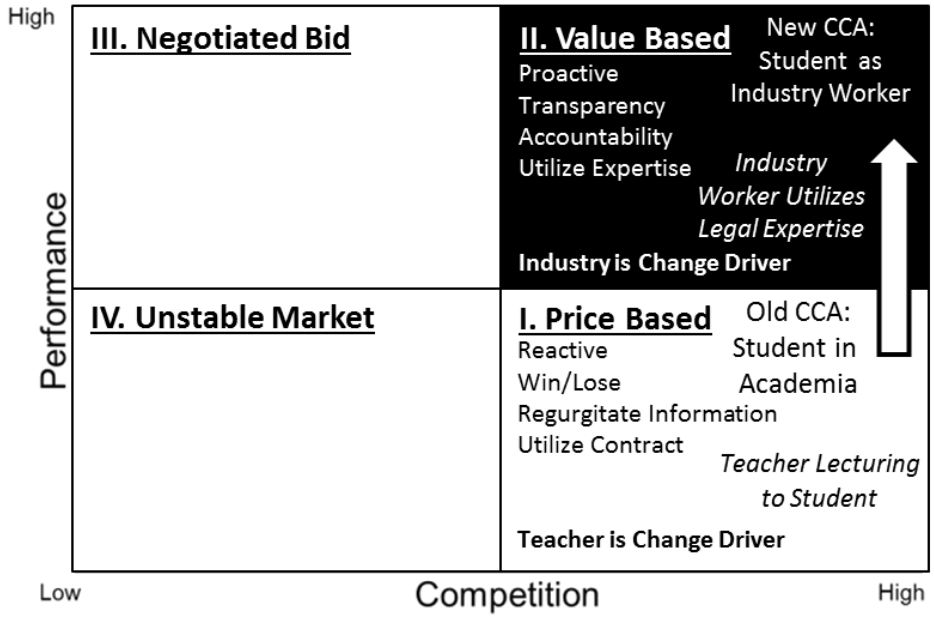

Figure 5: The CCA Class Implemented into the Industry Structure

The transformation of the CCA class is from a purely academic lecture to a transitional class into the industry (visualized in Figure 3). Students learn to utilize their construction knowledge and apply it to the current industry. Industry participants are brought in as experts and mentors to provide realistic contract problems that relate to the class topics. The students become industry workers and subject matter experts where they research an area, come up with solutions, consult the legal experts, and come back to teach their findings to the rest of the class. This method of having the students become the change driver would help prepare them for the industry.

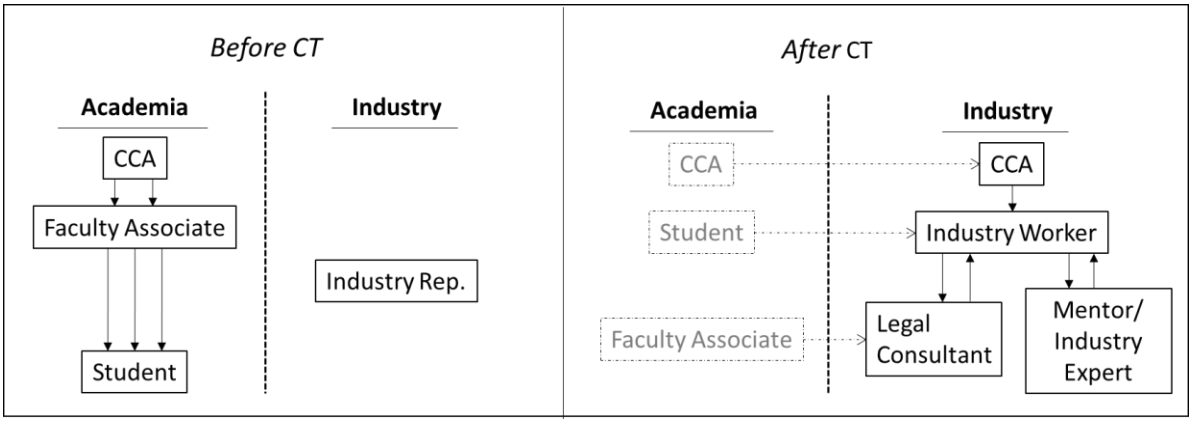

Figure 6: A visualization of the Class Transformation (CT)

Industry Structure

The previous CCA class only addressed the price based use of contracts; know the law and be able to utilize the contract to remedy a situation. This teaching method only focuses on being reactive and can create a win/lose situation. The class aims to improve this style of learning. Contracts should be simpler, easier to understand, and shorter. The only way to do that is to move to the value based environment which uses transparency and utilization of expertise (Kashiwagi, 2015). The new class format will show how to improve the way contracts are used by introducing the best value or optimal way to utilize contracts. The task was to transition from price based into value based contract management. As demonstrated in Figure 2, students will learn to create transparency, stop trying to control others, and identify and utilize expertise. The industry volunteers that participated in the class also accepted the value based environment approach because of its impact through short contracts and sole interaction with sub/specialized contractors who have expertise. This shows that the students can benefit professionally if they understand and apply this new method.

Student Transformation

The original CCA class did not connect to the other courses in the CM program. The new class needed to teach students to utilize the tools they have been given thus far in their academic curriculum, such as scheduling, cost estimating, project management, and client coordination. The goal is to change the students' role from a traditional reactionary model who listens to lectures and takes notes, to a subject matter expert. This new style of teaching has the students take the curriculum, research it, interface with the industry, utilize legal expertise, problem solve the material and then teach the results to their peers. The new student transition increased participation of other students and in their understanding of the topics being learned. Efforts to increase students' academic engagement are widely perceived to improve the quality of the undergraduate educational experience (Kuh, 2003).

The Class Project

The construction industry is viewed globally as a project based industry and this requires knowledge and the learning all aspects of construction projects (Fong, 2005). Because of this premises the class project was created to enhance the students' learning experience. It provided a roadmap to practicing the utilization of their skillsets as well as seeking expertise to verify a quality response. It also allows the students to get connected with the industry, finding out where the industry is and getting real life examples of how the class topics are used in the field. The industry professionals are also getting an opportunity to utilize students' innovative and new perspectives on project/case study dilemmas. The industry grades the students on their solutions, presentation, and professionalism (approach) during the course of the project.

The project is approximately 25% of the class grade. Specifically, the students will meet with the industry representative several times outside of the class to cover case study objectives regarding the topic in which the students are becoming subject matter experts in. Since the Fall 2010, the curriculum was developed by the

instructors with legal backgrounds on most common contract issues. The following is a list of the contract issues that were presented by students (Petrie, 2010):

- Payment Provisions
- Ethics
- Mechanic Lien Law
- Change Orders
- Unforeseen Conditions
- Time & Delay
- Liquidated Damages
- Insurance
- Bonding
- Indemnity
- Registrar of Contractors
- Dispute Resolution
- Best Value

The students' approach in solving the given case study allowed them to utilize their skillset from previous classes (estimating, project management, etc.), learning to research and becoming subject matter experts. The students would also present their possible solutions to the legal experts to discuss the feasibility of their solution, its impact on the parties (contractor and owner), and the contractual repercussions that follow. The legal experts' approach with the students is to make sure the solutions were legally correct and ensure the students also had a plan on how to prevent this problem from happening in the first place. The students also needed to cover the topic's basics such as definitions, important facts/points, and other material relating to quizzes, and future exams. The students' responsibility was to teach their peers and the project served as an example/case study to reinforce the topic on critical information that the rest of the class body would need to know.

A final meeting with the industry participants is scheduled to present the solution and receive any feedback the representative has, including possible alternatives or the actual result of the case-study and a comparison of their solutions. This would give the students an opportunity to peer into the industry culture and see the mentality of the current construction industry.

On the day of student presentations, the industry participants attend the class period and give the final grade. Students in the audience also provide their feedback (see Table 2). The discussion after each presentation has increased student participation and involvement, reflecting the benefit to this new teaching style. It allows educators to emphasis more on the student's learning experience.

Results

The following statistics are from a total of 4 years, 9 classes, 349 students, 147 student presentations, and 57 industry volunteers. The results are broken down into student outcomes, industry response and class administrator impact.

The implementation of this class structure had the students teaching on average 22% of the class. This calculation was made by taking the full time slotted for the class (2.75 hrs) and multiplying it by the number of lectures for the semester to find the total number of hours in the class (c). The number of presentations for the semester was multiplied by the allotted time given for each group on their presentation (0.5 hrs) to find the number of hours spent on the students' presentations (p). Finally, p was divided by c to find the percent of class taught by the students.
In an attempt to further involve the class in the presentations, the students were asked to grade their peers on their professionalism, preparation, presentation, and overall grade of the project presentation. On average, 45 students were involved in the class each semester. The results are listed below in Table 2:

Table 3

Student Peer Review of the Class Project

Criteria	Spring 2014	Fall 2013	Spring 2013	Fall 2012	Spring 2012	Fall 2011	Spring 2011	Fall 2010
Professionalism	9.6	9.3	9.2	9.2	9.4	9.4	9.5	8.9
Preparation	9.6	9.1	9.3	8.9	9.1	9.2	9.5	8.8
Presentation	9.4	9	9.1	8.8	8.9	9.0	9.3	8.8
Overall	9.6	9.2	9.2	9.0	9.2	9.2	9.4	8.9

At the end of the semester, the course evaluations were analyzed and the results revealed positive responses from the students. Before the transformation of the class the average class evaluation between the two faculty associates was 4.39 while their average instructor evaluation was 4.59 out of 5. Since the inception of the new class structure, both ratings dramatically increased to an average class rating of 4.53 and instructor rating of 4.72 out of 5. The 19% increase validated the transformation of the new CCA class and that we were headed in the right direction.

Industry Response

As of the fall 2013 semester the class has utilized 57 industry participants with an average 81% return rate for the volunteers. The average project grade was above 90% which shows us that the industry is satisfied with the students' solutions, presentations, and over all learning experience (Table 3). The results show a 6% increase of the students' learning ability from the start of the study, this is a key indicator the new approach is successful.

Table 4

Industry Grade of Class Project

Industry Grade	Spring 2014	Fall 2013	Spring 2013	Fall 2012	Spring 2012	Fall 2011	Spring 2011	Fall 2010
Project Ave.	95%	92%	93%	91%	92%	92%	92%	89%

A sample of the industry participants' comments from grading the student projects:

1. Good job identifying many of the major risks!
2. Excellent and thoughtful answers to the questions.
3. This group of students was very sharp, eager to learn, and understood the concepts quickly.
4. I think you are ready to change our industry.
5. This is the highest score I've given a group and I'm a hard grader. The students keep getting better each semester.

Discussion

A university can sustain and improve the quality of their educational program by collaborating with the industry and involving the industry in the class curriculum (Tener, 1996). This senior based class was at a transitional point to make a major impact on the students by using a new method to move forward to a value based industry. The student moved from the academic world to an industry worker. In the transition, the lawyers were no longer teachers, but served as legal consultants. Industry volunteers were also brought in to provide realistic contract problems that related to the class topics. The students were now acting like industry people where they researched the area, came up with solution and came back to teach their findings to the rest of the class. The industry volunteers are responsible to grade the students on the project results. This method of having the students become the change driver in an industry project would help prepare them for the industry.

The result was a more active role from the students, creating expertise and having them run a project that utilized all of the skillsets given to them in their program. The students implement transparency and expertise to transition from a price based to a value based method of managing contracts and projects.

Although the transformation of the class was proven successful a powerful argument in support of this position is that existing cultures of engagement may not be sufficient to meet the challenges of creativity and productivity of teaching in the new model in the 21st century (Brint 2008). Another challenge is ensuring each student receives the same experience every time can be altered by a change of industry partner, their own peers since it is group project driven, but overall the comments from the student evaluations indicate most students received similar experiences. The major elements of the structure of the class have been laid out and show significant positive results. However, further fine-tuning on the minor elements of the class structure will be considered for future research. Also further data is needed so will conduct additional surveys to capture a before taking the class what the student's knowledge of construction contracts is to afterward taken the class; this will take place in the next 3 semesters.

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