AC 2009-1915: AGC COMPETITION: SOME LESSONS LEARNED--THIRD TIME'S THE CHARM!

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Introduction

Once each year, students in construction educational fields across this nation are given a real-world, first-hand glimpse of their future. This proverbial "preview of coming attractions" presents itself in the form of regional competitions jointly sponsored by the Associated Schools of Construction (ASC) and the Associated General Contractors (AGC). The competition challenges student teams to assume roles consistent with industry project management teams prepared to develop a comprehensive plan for a constructive endeavor. Each team may compete in one of three tracks aligned with major construction categories:

1. Heavy Highway Construction
2. Design Build Construction
3. Commercial Construction

To create a distinctive feeling of reality, corporate sponsors for each category provide project statements from actual projects addressing scope, budgetary, and scheduling considerations. Project documents typically include bid documents, drawings, and specifications consistent with the competition category. Within twenty-four hours after receipt of the initial project package, the teams consisting of four to six students are expected to complete a project analysis and provide a formal presentation detailing a project proposal including a cost estimate, schedule, and bid documents as well project planning, organizational, and value engineering opportunities. Realistic procedures are in place throughout the competition to simulate formal communication between the "owners" and the teams including Requests for Information (RFI), submittals, and design addendums. Finally, for each respective category, the industry sponsors serve as judges assessing and evaluating each team's performance including specified deliverables, written reports, and the formal presentations. The winning team from each of the three categories is eligible for a trip later in the spring for a final round of competition during the annual AGC convention.

The Program in Construction Management at the University of North Carolina at Charlotte first participated in this competition in the Fall of 2006. The current Program Coordinator championed this initial foray and recorded accurately some lessons learned for the 2007 ASEE National Convention.[1] Now three years and three competitions later, this paper presents a critical review of the procedures, policies, and logistics supporting the AGC competition. This paper balances first hand observations from both faculty and students with objective input provided by the Competition judges and student feedback though surveys and written reports. The Department – both students and faculty – are determined to pursue this competition, and this paper will strive to evaluate the journey to date and perhaps point to a future path to success.

Pre-Competition Activities – Planning, Organizing, and Staffing:

Planning for the student competition commenced nearly a year before with the creation a 1-hour seminar course specifically for building and developing the student teams. Course learning outcomes and educational materials were designed to aid in student preparation for the competition; to effectively organize the student teams; and to develop a logistics support package to support student needs on-site. Presented in a "construction practices laboratory" format, brief lectures would typically provide input on topics of interest and then transition into 2-3 hours of facilitated, hands-on student work. Recognizing that the AGC competition required participants to develop a cost estimate and construction schedule for a given project, course work deliberately moved toward developing these skills within the student teams. Although it was recognized that each student team during the competition would require certain specialized skills (architectural design creation/interpretation, estimating, risk management, LEED, etc), the strategy was to develop universal, collective expertise evenly throughout the student teams rather than allowing the teams to have "specialists."

Critical decisions were made on the first day of the semester: student team assignments and targeted areas of competition. Naturally, proper staffing necessarily involved matching student desires and strengths with certain group dynamics in order to create competitive, functional teams. Initial student surveys captured both student preferences and experience. This information provided direct input to a faculty review of the students and an initial development of team assignments. An ideal team make-up typically would involve both Juniors and Seniors: the Seniors provide both leadership as well as technical expertise having competed a majority of the academic program; Juniors might also provide some expertise but participate primarily to provide continuity – to learn and gain experience for the next year's completion. Further, the competition allows for six (6) members for each team; because of the extreme workload for the competition, having a full contingent would seem critical to success. Unfortunately, the reality revealed that there was only nine students in the mix and involved no Seniors. Discussions between faculty and students collectively agreed on the make-up of two teams that would compete in "Heavy/Highway" and "Design-Build" – a team for the 3rd category of "Commercial" would wait for another year. With the teams now assigned, all future course work and discussions were organized to provide opportunities to work collectively, building teamwork and synergy as a precursor for the competition.

The course itself employed a work breakdown structure (WBS) combined with an appropriate sequence of construction as a foundation for both estimating and scheduling. Instruction provided theoretical underpinnings for the concepts and procedures, but ultimately students were provided real construction projects though case studies to develop and improve skills in developing a WBS and a construction sequence. Specifically, participants were provided the construction drawings for the improvement of a water treatment facility. The scope of work included construction of:

- Raw water intake
- Flocculation basin
- Sedimentation basin

- Membrane filtration building
- Clear-well
- Chemical treatment facilities
- High service pumping facilities
- Conversion of the existing pipe gallery
- Associated yard and plant piping

Participants used the construction drawings to identify the principle components of the project and develop the higher levels of a WBS. The developed WBS was used to prepare a general sequence of construction for the project. Photographs of the project taken during construction were used to demonstrate the actual sequence of construction. This allowed students to compare their general sequence to that of the contractor and develop a better understanding of the principle resource requirements.

The case study was also used to develop and improve the estimating skills of the competition participants. The project included the construction of a cast-in-place concrete clear-well, flocculation basin, and sedimentation basin. Each group was given the drawings for one of these project components. Groups performed quantity take-off procedures and estimated the construction cost using cost data from RS Means manuals.

Competition Day Execution – Directing and Controlling:

The student teams seemed very adept at setting up their "operations center" to support development of the project plan, mission analysis of the problem statement and project materials, the master schedule, and project deliverables. Administratively, the competition rules restrict each team to a single hotel room for the duration of the competition except for scheduled meetings or official communication traffic. Each of the three competitions – Heavy/Highway, Commercial, and Design-Build – included pre-qualification packages, periodic information briefings, issuance of addendums and Requests for Information, and submittals. Logistically, food and drink were routinely delivered to each team. Faculty mentors from respective Universities were prohibited from communicating with their team in any way, but the corporate sponsors were ever present, moving about the various teams to ensure that the teams were functioning and productively moving toward an a minimal solution. The restriction on communication reached the student teams in profound ways including an absolute prohibition on access to the internet as well as use of cell phones. The competition concluded with formal presentations given to the corporate sponsors by each respective team.

Perhaps one of the most significant educational pieces of this exercise was a formal "debriefing" given at the end of the competition. For each respective area, the corporate sponsors provided constructive feedback to the teams highlighting strengths and recommending specific improvements where needed. The significance of the debriefing though centered on the fact that although it certainly addressed certain "gamesmanship" strategies that would enhance team competitiveness, it also noted real world considerations of professional practice. Students

were given a glimpse of what successful engineering meant from the perspective of seasoned professionals. The continuous interaction during the competition and the formal debriefing at its conclusion combined to make his exercise a powerful drill for inspiring students.

Post Competition – After Action Review and Redeployment:

a. Student Feed Back:

The students enrolled in the AGC class had positive comments about the competition. It was described as a rewarding and challenging learning experience. The students benefited from the opportunity to enhance public speaking and communication skills. They enjoyed the exposure to real world situations and felt the competition was a valuable preparation for internships and jobs. One student stated appreciation for the competition as it helped him "learn to think like an engineer and a construction manager." Developing better relationships with faculty members and fellow students was another advantage of the experience. The students realize the emphasis on teamwork in the construction industry and stated that learning to work in a group was a great outcome of the class.

The students have an enthusiasm for returning to the AGC competition and are eager to improve their performance. They feel that now being familiar with the format of the competition and a having better understanding of the scope of the project will aid them in accomplishing this goal. Many suggest that having a minimum of six participants on each team, including an architecture student on the design-build team, would also improve their chance of success.

Several recommendations were given regarding the structure of the prep class. The students believe that having one faculty mentor per competition team would be preferable to the team teaching method that was employed. Completing a sample project from start to finish would improve their confidence. Upon finishing the sample project, students suggest then focusing on the skill sets found to be weak. Presenting the bid and estimate of the sample project during class time would improve their level of comfort with public speaking at the competition. The students also desire more practice working under time constraints to simulate the actual competition experience. A recommendation was made that the faculty introduce addendums to the sample project, so the students can become familiar with this process. The lower level students who participated would like to see more instruction on plan reading and industry related terminology.

b. Financial Costs: Budget Considerations

The planned budget noted in the appendix proved to be very close to the final tally. Expenditures for transportation fluctuated only in terms of the actual cost for the gas; rental fees and parking were very predictable and stable. The meals noted were for faculty mentors that traveled with the teams. Students were either responsible for their own meals or supported during the competition by corporate sponsors of the event. Lodging included rooms for the faculty mentors and for the teams; maximum occupancy rules by the hotel require a team with more than four members to reserve two rooms. Registration is per team and per faculty member.

While the total cost is not excessive, Department has expressed an interest in seeking Corporate sponsorship for this team competition.

c. Faculty Program Assessment

The faculty members involved in this effort from the initial planning through the post-competition activities routinely agreed to the merits of this program and generally echo some of the comments offered independently by the students. Benefits included a variety of positive impacts affecting both students as well as faculty.

- Student Engagement: The competition provided increased student engagement by providing many with their first hands-on "real" experience with construction techniques and procedures; it will also provide an opportunity for them to witness how their chosen field can benefit the community.

- Enhanced Faculty-Student Interaction: By integrating faculty into the program working side-by-side during the prep as well as during the trip, faculty-student interaction was enhanced through the required cooperative efforts. Faculty and students developed professional ties that benefitted both.

- Improved Student Cooperation: The program improved cooperation among students after they served on construction teams. Essentially, teamwork and synergy were critical for success.

- Promoted Active Learning: This program featured hands-on learning that directly promoted active learning. Led by seasoned professionals both as faculty and as corporate representatives, students learned by doing as active participants in a real-world constructive environment.

Conclusion:

This paper discusses participation in a regional construction management oriented student competition. The teams featured here did not win the competition, and yet, they were still victorious both collectively and individually. These students completed a rigorous construction management related project in either heavy/highway or design-build. Admittedly, the experience was challenging but it was rewarding as well. This paper presents a critical review of procedures, policies, and logistics supporting the AGC competition and balances first hand observations from both faculty and students. Without question, the program has been judged to be worth the investment in terms of both faculty and student time as well as financially, and the Department – both students and faculty – are recommitted to return next year with renewed determination to pursue this competition. As for plotting a course leading to victory, we will reinforce success and better prepare the teams to meet the high expectations of the competition. However, the students and faculty are unanimous in their opinion that although we did not leave the completion as the 1st place team, the students nevertheless came away as champions.

References:

1. Gehrig, Bruce and David S. Cottrell, "Lessons-Learned from First Time Participation in Construction Management Student Competition," Proceedings of the 2007 Annual Conference of the American Society for Engineering Education, Honolulu, Hawaii, June 2007.

Appendix A

Planned Budget for the AGC Student Competition

AGC Student Competition, Jacksonville, Fl, 22-25 Oct 08							
	Unit Cost	Miles	MPG	Days	Quantity	Sub-Total	TOTAL
Transportation							
Rental Gas	$ 4.00	838	13		2	$ 515.69	
Rental Car	$ 645.34			4	2	$ 1,290.68	
Parking (CLT)	$ 4.00			4		$ 16.00	
Local Driving	$ 0.51	15		2		$ 15.15	
Subtotal							$ 1,837.52
Meals							
Breakfast	$ 7.50			0	1	$ -	
Lunch	$ 9.75			4	1	$ 39.00	
Dinner	$ 19.00			3	1	$ 57.00	
Subtotal							$ 96.00
Lodging							
Room #1	$ 89.00			3	2	$ 534.00	
Room #1 Tax	$ 11.57			3	2	$ 69.42	
Room #2	$ 139.00			3	3	$ 1,251.00	
Room #2 Tax	$ 18.07			3	3	$ 162.63	
Subtotal							$ 2,017.05
Registration							
Student Teams	**$ 150.00**				2	$300.00	
Faculty	**$ 50.00**				2	$100.00	
Subtotal							$ 400.00
Total Projected Cost							$ 4,350.57