

Impact of Participation in the ASC Students' Competition on Students' Motivation to Learn

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Students' competition provides a non-traditional learning environment in which students learn by applying their knowledge from classroom in real world problems. The Associated Schools of Construction (ASC) regional students' competitions are one of popular students' competitions for Construction Management (CM) education. Many CM students who participate in the ASC students' competitions may learn new knowledge/skills from the competitions and come back to classroom to complete courses required for graduation. Their competition experiences can not only enhance their knowledge, but also get them motivated to learn in courses after the competitions. This paper is to share results of a study on impact of participation in students' competitions on students' motivation to learn. An online questionnaire survey was used to collect data about students' perception of impact of their participation in the ASC competitions on their learning afterwards. This paper shares the results about 1) what areas of CM education the competition participants get motivated to learn in through the ASC competitions and 2) what aspects of the competitions helped the students get motivated.

Key Words: Students' competition, motivation to learn, construction education

Introduction

Students' competition can provide a non-traditional learning environment for students and enhance their learning. Benefits of participation in intercollegiate competitions have been supported by many educators. CM students in the U.S. have a variety of opportunities for intercollegiate students' competition in which students can apply their knowledge into real world problems. The Associated Schools of Construction (ASC) holds regional competitions which are sponsored by construction companies. Many CM programs in the U.S. send teams for the ASC competitions and CM students can learn through the competitions.

Many CM students take advantage of the opportunity to apply what they learned from classroom into real world problems in the ASC students' competitions: they may confirm level of confident knowledge or may recognize level of deficient knowledge, and/or learn new knowledge/skills through competitions. Then, many of them need to complete courses required for graduation after the competitions. They bring not only new knowledge/skills learned or experience from the competitions, but also self-confidence in their career (Bigelow et al. 2013) and/or necessity to learn or get prepared for their careers.

This paper is to share results of a study about impacts of participation in students' competitions on students' learning in courses after the competitions: how competitions help students' motivation to learn. Students' perception about impacts of the ASC students' competitions on their learning after the competitions were asked through this research project.

Literature Review on Students' Competitions and their Learning

Students' competition, specifically intercollegiate competition, provides the opportunities of working in a challenging task of real world through teamwork and is an effective tool for active learning (Holt et al. 2012). In CM education, a variety of students' competitions have been offered and many schools have participated (i.e., Senior et al. 2014; Bigelow et al. 2013; Holt et al. 2012; Nobe et al. 2006). The CM program in the department of Technology at Illinois State University has sent multiple teams to several intercollegiate competitions each year such as ASC regional competition (commercial, design-build, and electrical divisions), National Association of Home Builders (NAHB) students' completion, Mechanical Contractors Association of America (MCAA) student's competition, and Department of Energy Race to Zero student design competition.

These competitions require participating students to compete in a team with a real world problem in all aspects of construction projects: cost estimating, scheduling, designing of mechanical system, safety, job site logistics, quality control, sustainable construction, business plan, marketing and teamwork (Cottrell et al. 2009, Anglin et al. 1999, and Ryan 1993). Therefore, students who participate in the competitions need to apply what they learned from classrooms into a real world problem (the competition project). Furthermore, the competitions require knowledge not explicitly gained in the classroom (Mikesell et al. 2012).

However, students may participate in competitions not in their last semester, but in an early semester. For example, the ASC region III students' competitions are held in mid of fall semester, thus the participating students cannot finish all the coursework, if they are to graduate in May. Also, many faculty coaches for students' competitions want to include sophomore or junior students on their teams for continuity (Cottrell et al. 2009). As a result, most of the students who participate in competitions have limited knowledge/skills for the competition due to incomplete coursework and cannot take advantage of the opportunity in full to apply what they take from classrooms to a real world case.

Instead, they need to take courses after the competitions and they bring what they learned from the competitions to classrooms afterwards. Many construction/technology educators or researchers studied benefits of students' competition (i.e. Senior et al. 2014; Bigelow et al. 2013; Nobe et al. 2006): motivation in the profession, exposure to real case, industry involvement, relating classroom learning to real world case, self-confidence, improvement of soft-skills (presentation skill, problem-solving skill, communication skill, leadership skill, and time management skills), recognition among peers, improvement of knowledge/skill, and enhanced prospects for employment. Thus, it is an important question to CM educators that what will be changed if they bring what they learn from the competitions back to classroom? Unfortunately no research or study has been performed on impacts of participation in students' competitions on students' learning in coursework afterwards.

Research Questions and Method

This research project sought the answers to the questions, "*What is the impact of participation in students' competition on their coursework afterwards? Can participation in student competition motivate students to learn that their performance in future coursework can be enhanced? How do students who participated in students' competition perceive impacts of the competition participation on learning in their coursework afterwards?*" The three main questions for the research were:

- 1) *How would you evaluate the impact of competition participation on your learning in overall CM coursework afterwards?*

This question is about students' perception about impacts of students' competition on performance in coursework afterwards overall.

- 2) *In what areas in the construction education does participation in students' competition motivate students to learn in coursework afterwards?*

In addition to the first question, this study plans to investigate impacts of participation in competitions on each area of construction education. The 20 Student Learning Objectives (SLO) developed by the American Council for Construction Education (ACCE) (ACCE 2014) were used as CM education areas: *Written Communication, Oral Presentation, Construction Safety, Cost Estimates, Project Scheduling, Construction Ethics, Construction Documents, Means and Methods, Management Skills, Construction Related Technology, Construction Surveying, Project Delivery Methods, Construction Risk, Construction Accounting, Construction Quality, Project Control, Construction Law, Sustainable Construction, Building Structure, and MEP.*

- 3) *What aspects of students' competition are effective in motivating students to learn in coursework afterwards?*

Students' competitions in construction/technology include a wide variety of aspects. Identification of 'motivating' aspects in competition can be adapted to CM courses to help students enhance their learning. The following aspects were found from literature review (Senior et al. 2014; Bigelow et al. 2013; Holt et al. 2012; Nobe et al. 2006) and from discussion among faculty coaches at the author's institution:

- *Relevance to real world:* opportunity to understand different aspects of construction project management.
- *Application of knowledge/skill:* opportunity to take what was learned in the classroom and to apply it in the real world case
- *Knowledge gain/improvement of skill:* opportunity to gain new knowledge or to improve skills related to construction management through self-learning or peer learning
- *Feedback from the judge panel:* either from the debriefing or detailed comments
- *Enhanced prospects for future employment*
- *Recognition among peers*
- *Self-efficacy convinced through the competition participation*
- *Recognition of deficient level of knowledge/skill:* opportunity to recognize that my knowledge/skill were not sufficient enough for the competition
- *Interaction with other students:* opportunity to become friends with other CM students
- *Interaction with faculty advisor*
- *Result of the competition*

This research used an anonymous online survey to collect data for students' perception about impact of participation in the ASC students' competitions on their learning afterwards. The online survey includes 4 demographic questions, one question for each research question as discussed above.

Online Questionnaire Survey and Results

The CM program at the author's institution has sent several teams for the ASC regional competitions each year: commercial, design-build, electrical and heavy/civil divisions since 2009. Total 65 students from the CM program at Illinois State University have participated in the ASC regional competitions. 11 students are still current CM

students at Illinois State University, and the remaining 54 already graduated. The students were contacted by the author through email, phone, or/and social networking services and invited for the online survey.

Table 1

Time of competition participation

Additional credit hours to complete for graduation	Number of responses	percentage
Less than 15 credit hours	6	17.14%
16 to 30 credit hours	17	48.57%
31 to 60 credit hours	9	25.71%
61 to 90 credit hours	3	8.57%
More than 90 credit hours	0	0%

The author could get only 35 responses out of 65 competition participants at the authors' institution (response rate of 53.85%). 14 respondents (40.00%) have participated in the ASC commercial competition, 12 respondents (34.29%) in the Design-build competition, and 6 respondents (17.14%) in the Electrical competition. As shown in Table 1, 6 respondents out of 35 (17.14%) participated in the ASC competition in their last semester. However, because the ASC region III competitions have been held in October, they had to complete CM courses after the competitions in their last semester. 29 respondents (82.86%) joined the competition prior to their last semester, and then, took CM courses.

Overall Impact of Participation in the Competitions on Students' Motivation to Learn

The first research question is about overall impact of participation in the ASC competitions on learning in coursework after the competition. Figure 1 shows that 24 respondents out of 35 (68.57%, either *Strongly Agree* or *Moderately Agree*) agreed that participation in the ASC competitions motivated their learning in coursework afterwards. The survey responses were weighted based on 5 point Likert scale: 5 points for *Strongly Agree*, 4 points for *Moderately Agree*, 3 points for *Neither Agree or Disagree*, 2 points for *Moderately Disagree*, and 1 point for *Strongly Disagree*. The mean value of the responses was determined significantly different from the expected mean value of 3.0 by T-test (with 95% confidence level and two tails).

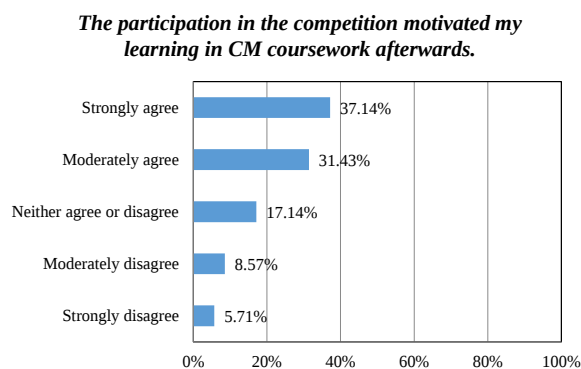


Figure 1: Impact of competition participation on coursework afterwards.

Impact of Participation in the Competitions on Students' Motivation for Learning with Regard to Areas for Construction Education

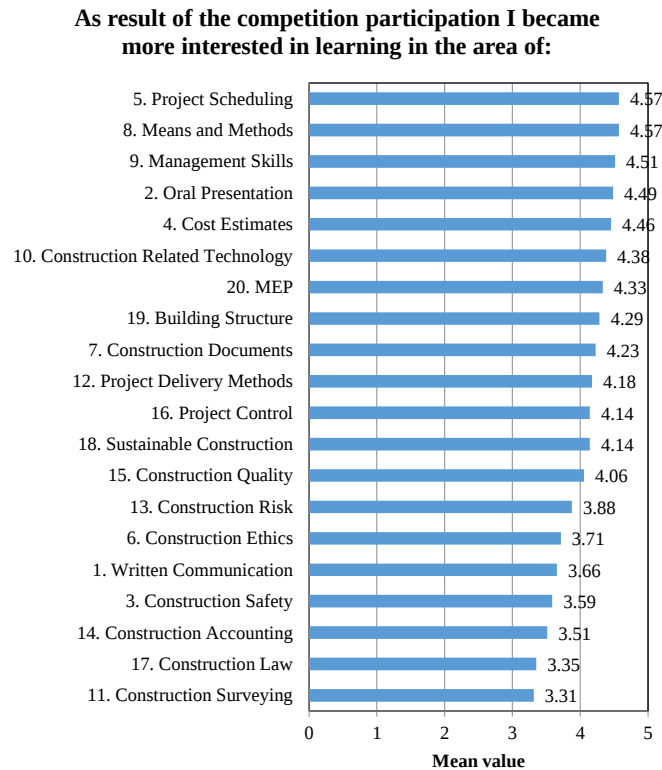


Figure 2: ACCE SLOs vs. student's motivation from competition participation.

The second question for this research project is about impact of competition participation on students' motivation in ACCE Student Learning Outcomes (SLO) areas. Detailed summary of responses for each ACCE SLO area is available in Appendix. Figure 2 shows average points for each ACCE SLO area. The survey responses for each of the SLO areas were also weighted based on 5 point Likert scale as discussed early. T-test was performed to find out if mean value of responses for each ACCE SLO area was significantly different from the expected mean value of 3.0 (with 95% confidence level and two tails). All the areas except *Construction Surveying* (#11) had a mean value which was significantly different from the expected mean value of 3.0. Therefore, it can be concluded that participation in the ASC competition was effective in motivating students to learn in all the ACCE SLO areas except *Construction Surveying* (#11). Figure 2 also shows rankings of the ACCE SLO areas according to mean value of the responses. While there is no significant difference between mean values for each of two adjacent ACCE SLO areas, the top two areas (*Project Scheduling* (#5) and *Means and Methods* (#8)) have significantly different mean values from those for *Building Structure* (#19) and the others below it: the ASC competition is more effective in students' motivation in *Project Scheduling* and *Means and Methods* than in *Building Structure* and the others below it.

Aspects of Competition Motivating Students' Motivation for Learning

The third question to be answered through the survey is about aspects of the competitions which motivate students' learning in coursework after the competition. Mean value for each 'motivating' aspect for competitions, which was discussed in the Research Questions and Method section, was determined by using 5 point Likert scale. Detailed summary of responses for each 'motivating' aspect of competitions is available in Appendix. Figure 3 shows rankings of the 11 aspects of competitions with regard to students' motivation. T-test was performed to find out if mean value of responses for each 'motivating' aspect was significantly different from the expected mean value of 3.0 (with 95% confidence level and two tails). Result of the T-test shows that all the 'motivating' aspects had

significantly different mean values than the expected mean value. All the ‘motivating’ aspects of the ASC competition were effective in motivating students’ learning in course work afterwards.

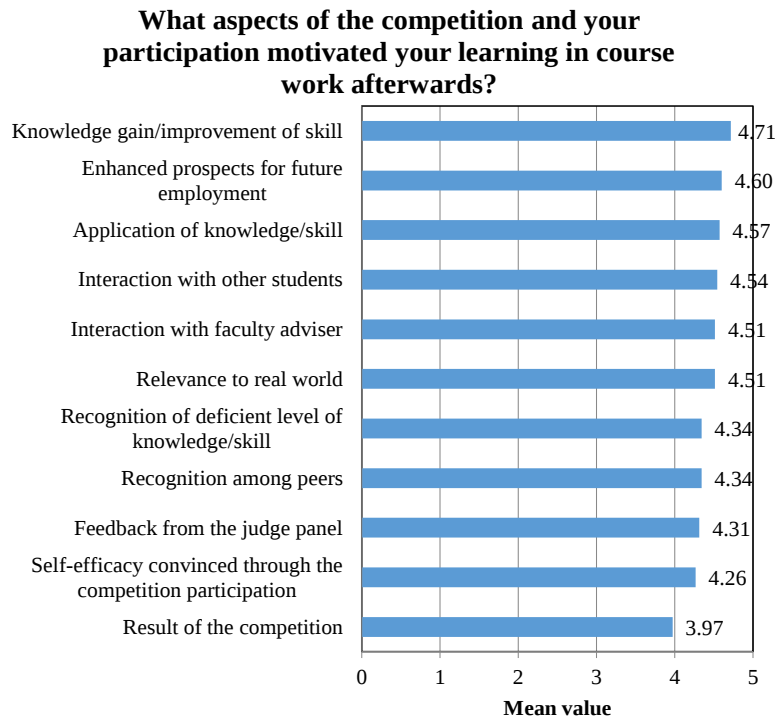


Figure 3: Competition aspects which helped students motivated.

Mean values of each adjacent pair of ‘motivating’ aspects shown in Figure 3 are not significantly different each other. However, the T-test result shows that Knowledge gain/improvement of skill aspect is significantly more effective in students’ motivation than the bottom five aspects (*Recognition of deficient level of knowledge/skill*, *Recognition among peers*, *Feedback from the judge panel*, *Self-efficacy convinced through the competition participation* and *Result of the competition*). The top 6 ‘motivating’ aspects of competitions which motivate students to learn are *Knowledge gain/improvement of skill*, *Enhanced prospects for future employment*, *Application of knowledge/skill*, *Interaction with other students*, *Interaction with faculty adviser* and *Relevance to real world*. The two least motivating aspects are *Result of the competition* and *Self-efficacy convinced through the competition participation*.

Discussion

Means and Methods is the top CM education area in which the survey respondents got motivated to learn the most by the competition participation. At the author’s institution, two CM courses to cover Means and Methods are offered in the first year of the CM course sequence and all the students who participate in the ASC competitions finish the courses before joining in the ASC competitions. Based on another result that respondents got motivated the most by *Knowledge gain/improvement of skill* through the competitions, it can be interpreted that more diverse cases or examples in the area of *Means and Methods* are recommended to be incorporated in CM education. *Management Skills* is placed in the third. It can indicate that students recognize importance of teamwork and management skills for better teamwork through 16 hours for the competition.

Knowledge gain/improvement of skill, *Application of knowledge/skill*, and *Relevance to real world* are ranked in the top 6 motivating aspects, and this result was as expected by the author: application of knowledge in real world cases could motivate students. *Interaction with faculty adviser* and *Interaction with other students* are placed after the top 3. It indicates that learning environment such as friendly atmosphere in classroom affects students' motivation and learning. *Result of the competition: placement or non-placement* is ranked as the least motivating aspect. It indicates that competition among students itself does not play a great role in motivating students' and their learning.

Conclusions

Participation in students' competition is recommended to CM students due to many benefits. Specifically, students' competitions in CM area are based on real world problems and application of what CM students learned from their class into real world problem can enhance students' learning. Based on the fact that many CM students need to finish courses after participation in students' competition, this research project had questions about impacts of participation in students' competitions on students' motivation in their coursework after competitions.

- 1) *What is overall impact of competition on students' motivation to learn in their coursework afterwards?*

It is found that students who participate in the ASC competitions get motivated to learn. Therefore, participation in the ASC competitions can help students learning through future coursework.

- 2) *What areas of CM education is the ASC competition effective for students' motivation in?*

The 20 ACCE SLOs were ranked with regard to student's motivation through the ASC competitions. The ranks can be mostly affected by contents or requirements for competition problems and vary depending on different types of competition. However, the result of this research project shows students who participate in the ASC competitions get motivated for future learning in all the 20 areas.

- 3) *What aspect of the ASC competition is effective for students' motivation?*

Total 11 'motivating' aspects of competitions are ranked in terms of effectiveness in students' motivation. The top 5 'motivating' aspects are *Knowledge gain/improvement of skill*, *Enhanced prospects for future employment*, *Application of knowledge/skill*, *Interaction with other students*, and *Interaction with faculty adviser*.

One of limitations in this research project is relatively small sample size of 35. Also, those are limited in CM students' participation at the author's institution. Therefore, a future research to investigate impact of participation in the ASC competitions on students' motivation to learn afterwards is recommended to expand to all regional ASC competitions in the U.S.

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Appendix: Summary of responses for the research question 2 and 3

- Research question #2: *As result of the competition participation, I became more interested in learning in the area of:*
- Research question #3: *What aspects of the competition and your participation motivated your learning in course work afterwards?*

