Experiential Student Learning through Collaborative Simulated Bidding Competition

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This evidence-based paper will show the effectiveness and achievement potential of a collaborative experiential learning project to support student success in post-secondary education. Student projects involving simulation have proven to be beneficial for many stakeholders including students, faculty and industry. This paper reviews literature surrounding common features of experiential learning projects and uses an annual national bidding competition in Canada as a case study to highlight and support the findings. This simulated student bid competition is a yearly event to introduce students to the real life challenges associated with the construction estimating and bidding process. Students across Canada submit complete bids based on a set of construction documents. The bids are judged based on three criteria: closest to the target price, most accurate bid package, and most outstanding professional submission. Students worked collaboratively with industry mentors, including faculty from the area of construction management and accounting. The findings of this paper show the benefits and provide recommendations to effectively embed experiential projects into curriculum.

Introduction

Programs that include an experiential learning component contribute to increased rates of (program) completion (Canadian Council of Learning, 2009). Downey et al. (2002) suggested that co-operative education results in improved labour market outcomes and employability for graduates. Boggu and Sundrasingh (2019) concluded in a study that experiential learning cycle activities implicitly foster learner autonomy and enable learning necessary skills for the workplace. The study was based on convenience sampling of 60 undergraduate students, enrolled in various pathways on the business programme and selected for this study. Garraway and Volbrecht (2011) argued that knowledge transfer is not a simple process of application but rather one of re-contextualisation of previously learnt knowledge, which requires some form of reflection on experience and previous learning is necessary. Inguva et al. (2018) employed participatory design for design and development of a systems control and reaction engineering laboratory project. The nature of stakeholder interaction at various levels was analysed and specific examples for how such an approach improved the development process presented. The study concluded that students were intellectually stimulated by the module design, enhancing the overall teaching and learning process.

Naufalin et al. (2016) concluded that experiential learning is an effective model to improve students’ soft skills in the subject of entrepreneurship. The study showed that it increased the dimension of confidence by 52.1%, result-oriented by 22.9%, being courageous to take risks by 10.4%, leadership by 12.5%, originality by 10.4%, and future-oriented by 18.8%. Coker et al. (2017) conducted a 5-year study of graduating seniors (n=2,058) to evaluate the impacts of experiential learning depth (amount of time commitment) and breadth (number of different types of experiences) on student outcomes. Both depth and breadth were associated with acquiring a broad general education, writing clearly and effectively, contributing to the welfare of communities, relationships with faculty and administration, and desire to attend the same institution. The study concluded that key learning outcomes desired for a college student are driven by both experiential learning depth and breadth. Bauermeister (2016) et al. advocated that
students are given an opportunity to develop self-awareness of their leadership style, practice how to be an effective leader, use interpersonal skills to manage relationships, design a team structure, by means of the experiential learning through executing a project. Anderson et. al (2016) demonstrated the use of importance-performance analysis to guide the instructional design of experiential learning activities.

The Construction Institute of Canada (TCIC) organizes an annual simulated student bid competition for the construction management students and programs across the Canada. The intent of the competition is to provide a real life experience of the construction bidding process. Students in the undergraduate program, Bachelor of Technology in Construction Management (BTCM), from Northern Alberta Institute of Technology (NAIT) participated in the competition. Each team submitted a bid package for a real life construction project. Participation in the competition was integrated with one of the core courses, and hence, and was made part of the course evaluations. This paper summarizes the lessons learned from the participation in this simulated bidding competition, especially from the perspective of experiential learning.

Experiential Learning

Most courses related to estimating and bidding in the construction industry are focused on the theory and the underlying concepts to prepare a good estimate. Pedagogical approach typically involves explaining the concepts in classroom settings and providing in-class exercises to promote understanding. This approach has some inherent limitations. For example, students struggle to see how all the concepts can be to real life projects in an integrated perspective. In real world projects, interfaces between various stakeholders are critical to generate a successful bid. An estimator has to interface with a multitude of team members (engineer, scheduler, contractors, sub contractors, accountant, procurement manager etc.) to generate an accurate estimate and hence successful bid package.

In this case study, throughout the duration of the competition, the course instructors mentored the student teams (four students per team). In addition to faculty support, each team was required to solicit the support of an industry mentor, who guided them through the process. Participation in the competition provided a unique opportunity to the instructors to bring an experiential leaning environment in the course delivery.

Collaborative Process

Each team registered for the competition under a fictitious general contracting firm name. All the bidding documentation, addenda, and request for information (RFI) for a construction project, of $5-50M size, was managed through electronic Plan Rooms. Once registered, the bid committee issued the Instructions to Bidders document to the teams, specifying all the bidding requirements. Teams downloaded the documentation, from the Plan Room (web portal), including drawings, specifications, and contact documentation. Teams worked collaboratively to perform the quantity takeoffs for the project. To bring in the component of experiential learning, students were required to use Canadian Institute of Quantity Surveyors (CIQS) standards. They were also encouraged to use tools/software such as RS means, InfiniteSource, and BlueBeam for this purpose. Access to these tools was provided free of cost to the student teams by TCIC.
The duration of the competition was 8-10 weeks which represents typical timelines of real life construction project estimates of the scope for this paper. All the addenda and RFIs were formally issued and submitted through the Plan Rooms, simulating real world environment. Subcontractors quotes were released to the teams, for analysis and inclusion in estimates. As part of the competition, teams were required to provide sub-contractor analysis. Bids were closed at local construction offices. Teams were required to submit an electronic copy of the bid documents by the bid closing time, followed by hard copy submission with in 24 hours of bid closing time. Submitted bid packages were evaluated against the evaluation rubric and each team was provided with the detailed breakdown of results, along with the opportunity to appeal.

Observations based on Bid Submission

This section of the paper provides an analysis of the bid submissions with respect to the three main evaluation criteria which are the following: closest to the target price, most accurate and most professional bid. These three criteria form the basis of the team’s overall score for the project.

This national competition involved teams from multiple schools throughout Canada with a total of 72 bids submitted. Out of these 72 bids, 14 were non-compliant while 58 bids were compliant. The bids that were non-compliant did not meet one or more of following requirements: a. timely submission, b. completeness of information, c. acknowledgement of addendums, and d. other mistakes and errors typically found on bids which results in disqualification.

Although the teams had a strong compliance results, more teams submitted an incomplete bids (33 teams) than a complete bids (39 team). Based on a debriefing session with students following the competition, students commented the time commitment for the project was not adequate enough to finish off the submission completely.

The teams’ estimate to the target price was very impressive with the 58 compliant bids in our analysis for this criteria (Figure 1). Note that 83% of the compliant bids were within 10% of the target price with 19% of the bids within 1%. In fact, one bid was only $1,260.64 from the target price of $29,743,771.22.

![Figure 1: Spread of bids around target price](image-url)
Considerable effort was essential to estimate each of the various MasterFormat divisions for the project. However, teams were able to get good results as indicated in Figure 2 below. As noted in the Figure 2, 21% of all bids were within 10% of the division estimates and the results jumps up to 57% for within 15% of the division estimates.

![Cumulative percentage of bids](image)

**Figure 2: Accuracy of bids with divisions**

The third criteria in this competition was the most professional bid based on their professionalism in RFI, email communication, scheduling, organization and other items. As noted in the Figure 3, most of the teams scored between 70-79%.

![Number of bids](image)

**Figure 3: Bid evaluation based on professionalism**

All the teams were graded overall from the three criteria listed in preceding discussion. As noted in Figure 4, the majority of teams scored between 80-89% out of the 33 complete bids. Based on the grades achieved by the teams, one can conclude that teams did very well in achieving the academic objectives of the exercise.
Observations based on Experiential Learning

After the close of the competition, BTCM teams were invited to share the experience and lessons learned with the peers. The following are the key points that highlighted the value of experiential learning.

Students appreciated the opportunity of team work, especially in the area of material take-offs. Given the scale of the project, all the material takeoffs could not be performed by one person. So students had to split into groups and work collaboratively to achieve this objective. Use of online tools/software, presented an initial challenge in terms of a steep learning curve. But once mastered, these tools facilitated efficiency and collaboration. Reading the real project construction drawings added a practical dimension to the existing skills. Some of the teams appreciated the opportunity of cross referring between the drawings and specifications. Such opportunities are generally missing in typical class room teaching of the subject. Integration with the mobilization plan and the project schedule with estimates is another major learning outcome for the students, which could be attributed to experiential learning in the simulated environment. Some of the suggested areas of improvement included increasing the size of the student teams (due to associated workload), prior demonstration/tutorials on software, and more instructions on mapping the information from the construction drawings to the relevant software (RS Means).

All the teams provided positive reviews about the involvement of industry mentors in the project. Integration of the estimate with project accounting was another major learning outcome. An industry expert from an accounting discipline was invited to work with the teams on the escalation and cost control aspects of the project. A hands-on exercise was undertaken in the class to help students estimate the escalation for the project. In addition to this, the expert worked with the students to help understand the direct and indirect costs, map these costs to the financial accounting system, understand job cost accounting methods, to help track and review costs during the execution of the project and work towards the best possible bid.

Conclusion

Overall feedback by students confirmed the value addition provided by the simulated student bid competition. Students appreciated the opportunity to use all the learnings in a holistic way to solve a problem, in this case to provide an estimate for a construction project. Experiential
learning in a simulated environment provided students an opportunity to experience and address the challenges associated with the interfacing of different knowledge areas. The observations in this paper are in line with a study at the national level, performed by Regmi and Willis (2018), which established that the TCIC’s simulated student bid competition challenged students to understand and tackle the bidding and estimating process on real world construction projects.
References


