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Examination of a Post-Disaster Recovery Service-Learning Course: A Case Study

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The number of catastrophic natural disasters is on the rise. Also escalating is the movement for universities to include high-impact educational practices. This case study explores the recent development of a course in a construction management undergraduate program and the efficacy of student learning from such. The course interweaves the complex disaster recovery process and a high-impact experiential learning opportunity through an extended “Study Beyond” short-term trip. The study provides a detailed account of the development and execution of the course for three consecutive semesters. Additionally, the study encapsulates multiple data points from students and faculty to assess the efficacy of such a uniquely developed course. The results indicate the students ranked serving others, the hands-on components, and working as a member of the collaborative team as the top three strengths of the course. Findings from the student learning assessments included acquiring and strengthening vital skills the industry desires of construction managers including time management, communication skills, and conflict resolution. Dissemination of this case study may be useful in starting similar courses at other institutions.

Key Words: Service-learning, Construction Education, Community Engagement, Disaster Recovery, Experiential Learning, Case Study

Introduction

The tangible, rich hands-on characteristics of the construction industry correspond to the learning style in construction education throughout the United States. Deeper learning happens by doing (Anzai & Simon, 1979), and construction management programs across the United States exemplify experiential learning. Educators are tasked with forming new, engaging educational experiences to foster that optimal learning environment for the students. While educators constantly seek inventive ways to provoke learning by doing, the world continues to present complicated circumstances that need attention and solutions.

Natural disasters in the United States are currently on the rise. Hurricanes Harvey, Irma, and Maria caused an estimated 245 billion USD in total economic damages for the Atlantic hurricane season in 2017 (Klotzbach et al., 2018). Wild fires, tornadoes, and flooding are also wreaking havoc across the country. With an increasing frequency and economic impact of disasters, the response to post-disaster reconstruction is increasing proportionately. The need for more private and public organizations to collaborate and engage in these efforts remains a critical topic. Non-profit organizations continual need for volunteers months after a disaster is proof of the gap.

This paper describes the creation of a service-learning course focused on the processes of recovery and reconstruction after devastation occurs from natural disasters.

Literature Review

Across the United States, natural disasters are despondently creating hardship for communities. The post-disaster construction recovery process is broken into numerous phases (Uddin and Pradhananga, 2019). Understanding how communities and societies recover after the devastating effects of a natural disaster is a skill that built environment professionals are uniquely positioned to undertake (Haigh et al., 2006). Chang-Richards (2017) found critical constraints in disaster recovery resourcing such as: limited technical capability available nationally, lack of information about reconstruction workloads, and inadequate operational capacity within construction organizations. Construction professionals in particular are equipped to create solutions to such constraints, as well as, serve a critical role in the disaster preparedness, response, and recovery efforts. Because construction management programs prepare the future of the construction industry, students learning about the natural disaster impacts and the phases of recovery logically would benefit all stakeholders.

Construction management programs continue to increase opportunities for each student to apply the course content in the framework of experiential learning activities. Extensive research has identified gaining real-world experience throughout college improves the learning curve for an individual entering the construction industry, making them more resourceful and effective industry professionals (Collins and Redden, 2020; Brncich et al., 2011; Bigelow et al., 2013). Additionally, service-learning (SL) is a widely used, researched, and respected high-impact educational practice (Brown, 2000; Finley, 2011; Gelmon et al., 2018). Prior studies have found student benefits by participating in various high-impact educational practices include: enhanced learning, improved technical and soft skills, and provided growing opportunities in their personal and professional development (Love et al., 2020; Olbina et al., 2018).

Educational programs on crisis, disaster, and/or emergency management have materialized in the last few decades. However, the majority of these programs have limited teaching in the specific area of construction management processes, particularly building reconstruction/renovations. There are few CM programs which offer students a track option to focus on disaster and emergency reconstruction. A notable gap of the incorporation of disaster recovery management and reconstruction content exists in most American Council for Construction Education (ACCE) accredited programs. Relevant literature needs to share best practices for programs to integrate the high-impact educational practice of a project focused on serving those directly impacted by a large-scale natural disaster. This paper aims to fill the primary gap in previous research by highlighting a case study of the development and implementation of a disaster recovery SL course with a short-term trip to serve a community devastated by natural disaster.

Case Study

The purpose of this section is twofold. First, the course design and evolution of the course are described. This may be useful for peer institutions looking to create a similar course from this template or for educators seeking new ways to incorporate a SL trip within existing curriculum. Second, student and instructor perceptions regarding this course are provided to highlight the effectiveness of the course. The two elements contained within this section are mutually reinforcing and essential in validating the efficacy of the course.

Concept and Pilot Program Execution

Both the undergraduate and graduate curriculums at the McWhorter School of Building Science at Auburn University require students to earn elective credits (6 hours minimum) prior to graduation. The elective offerings each semester vary; however, in the last ten years, topics such as global construction management, lean construction principles and practices, advanced building information modeling (BIM), and unmanned aircraft systems (UAS) in construction have gained the most enrollment numbers. However, in exit interviews upon graduating, both undergraduate and graduate students consistently stated they desired more choices for elective offerings.

Many construction management students desire an increase in hands-on, experiential learning and studies outside of the traditional classroom environment (Farrow and Burt, 2018). Based on the review of elective offerings at peer-institutions and a thorough literature review of construction management student learning preferences, an envisioned program began to form. The initial objectives of the program were to:

- introduce students to content concentrated on disaster management, post-disaster reconstruction, and volunteerism in post-disaster communities,
- lower or eliminate the financial barrier to participate in high-impact practices in order to be more inclusive of students who may not have abundant financial resources,
- increase the hands-on learning opportunities offered to students,
- serve rural communities with recognized financial deficiencies in the United States,
- provide an avenue for students to gain deeper exposure to the residential market sector.

The organization of a short-term SL “Study Beyond” program began in the fall of 2017 after Hurricane Harvey hit Texas. The inaugural trip (shown as Trip No. 1 in Table 1) was not academically tied to any course or credit in the curriculum. This served as a pilot study for the viability of creating an elective course, one which would align with the academic institution’s spring break.

In September 2017, the instructor initiated a partnership with a non-profit. The non-profit had comprehensive experience in aiding devastated rural communities from natural disasters. The non-profit possessed two notable attributes: (1) sound funding in place for long-term reconstruction repairs (materials, tools, etc.), and (2) a well-established case management structure to properly evaluate the recipients of the service work. These attributes eliminated a significant layer of complexity for the instructor and reduced the barriers for crafting such a program with the university. (Note: the non-profit has requested to remain anonymous in this publication for self-effacement.) The non-profit and the instructor collaborated on logistics, accommodations, and the project scope. The instructor created a budget for a total of ten people – eight students and two faculty.

Students submitted applications to be considered for the trip. The link to the application was sent out to all junior and senior level undergraduate students and graduate students. As part of the application, students wrote a short essay responding to the prompt: “What do you desire to learn from this experience? Why do you want to participate in this opportunity?” Seven students applied to participate. All applicants met the criteria to be accepted to participate. Once the 2018 spring semester started, the instructor organized two skill/craft training sessions to prepare the students for the work, as well as offer team building opportunities prior to the trip start. The trip began on a Thursday and concluded the following Wednesday. The events on the trip included:

- Four 10-hour days of SL work: selective demolition, framing and drywall repairs to four existing homes that suffered flood damage due to prolonged water exposure.
- A jobsite visit in Houston, TX to a multi-million dollar, new construction project in the commercial market sector hosted by Linbeck.
- A “free” half-day for students to have the opportunity to explore historic Galveston and acquire knowledge of the local culture and architecture as desired.

The inaugural trip proved to be a great success. For seven students and two faculty, the final cost was slightly less than \$7,000.00 total. All seven students stated they would recommend the experience to classmates. The experiences of the inaugural trip was evidence to move forward with developing an elective course.

Course Design and the “Study Beyond” Program

During the summer of 2018, the course learning objectives, syllabus, and coursework were developed for the new elective course. The 3-credit hour course was structured as a 1-hr lecture credit and a 2-hr lab credit. The course learning objectives include understanding construction management processes in post-disaster reconstruction, disaster management, volunteerism in disasters in the US and abroad, and community resilience initiatives. In the first five weeks of the course, the content comprised of:

- case studies and damage assessment research assignments of recent natural disasters,
- investigation and discussion of the roles of various stakeholders in the disaster process: governmental and non-governmental agencies,
- the health and care of the people we serve: survivors of devastating disasters,
- hands-on, skilled lab sessions for the physical work to be performed on the trip (most commonly: wood framing, drywall installation and finishing, and carpentry skills),
- project management and field supervision documentation on construction sites,
- residential construction safety in post-disaster environments.

In fall 2018, Hurricane Michael hit the U.S. Gulf Coast. The instructor initiated contact with the same non-profit partner and began the coordination effort to organize the Spring 2019 Study Beyond program (Trip No. 2 in Table 1). The student application link was distributed, and 20 student applications were received. Four of the 20 students had a conflict with engaging on the trip during the university’s spring break. Therefore, they were not enrolled in the course as several major assessments are tied to participating in the Study Beyond trip portion of the course. Table 1 below summarizes the details of trips 2, 3, and 4 which were all embedded into a Disaster Recovery elective course taught during the spring 2019, fall 2019, and spring 2020 semesters.

Table 1

Natural disaster details and corresponding service-learning course information

Trip No.	Natural Disaster	Date of Natural Disaster	Disaster Rating / Max Wind Speed	State of Trip	Semester Trip Occurred	Student Total
1	Hurricane	Sept 2017	Category 4 / 134 mph	Texas	Spring 2018	7
2	Hurricane	Oct 2018	Category 5/ 162 mph	Florida	Spring 2019	16
3	Tornado	Mar 2019	EF-4 / 170 mph	Alabama	Fall 2019	10
4	Hurricane	Oct 2018	Category 5/ 162 mph	Florida	Spring 2020	14

During the Study Beyond trip, assignments centered on project management and field operations are incorporated into the coursework. Students complete a jobsite daily report for each day of work. Project teams conduct and document participation in a daily morning toolbox talk relevant to the scope being performed each day. Before commencement of each new scope of work on a project, a pre-installation briefing is conducted with the instructor, a non-profit partner representative, the homeowner(s) of the property, and the student team. The briefing is used to identify major safety risks, tools/equipment needs, and quality expectations. One of the course's major assessment components is a final written reflection paper done by each student at the conclusion of the course. The distribution of coursework strives to strike an even balance throughout the semester and not link a student's grade in the course to craft skills demonstrated on the trip itself.

The balance of this paper includes a description and analysis of the students' and instructor's perceptions concerning the efficacy of the course after being offered for three consecutive semesters.

Results

The course's impact on student learning was assessed using anonymous questionnaire results, written reflection essays, and observations. All students were asked to complete two questionnaires at the completion of the course: one to provide course feedback and the second to evaluate their peers and to assess the teamwork skills acquired throughout the course. Additionally, students completed a written reflection after the completion of the Study Beyond trip component of the course. Finally, faculty observations were recorded concerning how the course experiences affected the participating students. These methods of assessment, particularly student reflection, are viable according to the vast literature in the area of high-impact educational practices (Kuh, 2008; Love et al., 2020; Olbina et al., 2018).

Questionnaires

The response rate was 100% for all three semesters the elective course was offered (Spring 2019, Fall 2020, Spring 2020) for a total of 40 respondents. On a 10-point scale (0: not effective at all; 10: extremely effective), all students answered 9+ when responding to the statement "Considering both the limitations and possibilities of the subject matter and the course learning objectives, how would you rate the overall effectiveness of the course". The remaining questions presented below were on a 7-point scale.

The responses referring to overall knowledge gained from the course had the following results:

- When responding to the statement: “Overall, how satisfied or dissatisfied are you with the experience/opportunity this course offered?”
 - 87.5% of students answered “very satisfied” (highest ranking offered)
 - 10% of students answered “satisfied”
 - 2.5% of students answered “somewhat dissatisfied”
- When responding to the statement: “Overall, how easy or difficult did you find it to contribute to the team(s) when working on the Study Beyond trip or during the training sessions?”
 - 67.5% of students answered “extremely easy” (highest ranking offered)
 - 25% of students answered “moderately easy”
 - 7.5% of students answered “neither easy nor difficult”

The responses referring to logistics and safety on the Study Beyond trip had the following results:

- When responding to the statement: “How safe or unsafe did you feel while performing the work on the Study Beyond trip?”
 - 67.5% of students answered “extremely safe” (highest ranking offered)
 - 30% of students answered “moderately safe”
 - 2.5% of students answered “moderately unsafe”
- When responding to the statement: “How easy or difficult was it to obtain the resources each project needed to complete the work on the Study Beyond trip?”
 - 77.5% of students answered “extremely easy” or “moderately easy”
 - 22.5% of students answered “slightly easy” or “neither easy nor difficult”

The questionnaires’ results indicate a comparable course structure is a valuable teaching and self-assessment method for student’s collaboration skills. These responses affirm the importance of including safety training and safety management in the classroom prior to the hands-on work. The results also indicate the value of faculty work with the non-profit on thorough resource availability, resource management, and logistics to ensure students focus on execution of the work in the short amount of time provided during the trip.

Table 2

Ranking of greatest strength(s) of the course

Term	# of students	Hands-on components	Teamwork/collaboration	Serving/ helping others
Spring 2019	16	2	1	3
Fall 2019	10	2	3	1
Spring 2020	14	1	2	3

Table 2 data provides the theme ranking of the coded responses to the open-ended question, “Please identify what you consider to be the greatest strength(s) of the course?” Interestingly, the answer fluctuated between three primary findings depending on the course semester. The Spring 2019 class ranked “Teamwork/collaboration” most frequently, while the Fall 2019 class most noted “Serving/helping others” as the greatest strength of the course. Spring 2020 students ranked the “Hands-on components” as the greatest strength. Through these rankings, consistency among the most important aspects of the course was evident to all participating students.

Quotes to encapsulate the strengths according to the students include:

- “The hands-on construction experience was great for me. I understood the concepts of the work prior to the trip but had very little experience. I now feel more confident in my ability to plan and coordinate trade packages because of this experience.” *Student A*
- “Providing time to serve others, while we simultaneously worked to become better construction managers was the greatest strength of the course.” *Student F*
- “The promotion of friendship, teamwork and working on achieving a goal together...”
Student B

Reflections

Each student wrote a reflection of their learning and experience after the Study Beyond program. The reflections revealed common themes including teamwork, time management, leadership, communication, conflict resolution, and gratitude.

The students expressed interest and appreciation for the significant engagement of several key non-profits in disaster recovery for vulnerable populations. The written reflections also expressed the struggles presented in any high-intensity collaborative effort. Many students admitted they did not understand the elongated process communities endure when devastated by a natural disaster prior to taking this class. A number of students assumed communities only needed volunteer help during the immediate hours and weeks after a disaster. A resounding message in their reflections was centered on the realization that headlines fade fast, but the need for long-term reconstruction is still present in these devastated communities.

Observations

Observations from the instructor confirm the surveys and reflections above. Students developed their leadership and teamwork abilities by synthesizing information and solving problems. The instructor observed the training sessions and the Study Beyond trip as extraordinary, low-pressure learning opportunities for students who are inexperienced in field operations.

Farrow and Kramer (2009) found the two largest obstacles for participation in university programs to be cost and other commitments that present a challenge to be away for more than 7 consecutive days. A notable demographic observation by the instructor referenced how the course attracted a diverse student enrollment, and the promising inclusivity by eliminating these two obstacles to participate in this program. The collected data did not dive deep into the demographics of each student, so the author is limited in providing specifics regarding this observation in this study. However, it is a curious finding to assess moving forward as the course continues.

Finally, SL trips foster a positive dynamic between faculty and students that typically does not occur in a traditional classroom setting. Working alongside one another, students develop a greater respect for professors and professors a friendship with the students (Tinker and Tramel, 2002). Multiple students voiced and recorded the heightened engagement and respect for the faculty.

Using the three assessment methods concerning the efficacy of the newly developed course, it is clear that the course has carved out an intensely successful educational opportunity.

Conclusions

Service-learning incorporates critical high-impact educational practices for many colleges and universities today. This paper describes the creation of a new post-disaster reconstruction service-learning course at the McWhorter School of Building Science at Auburn University, where the focus is to foster deeper metacognitive knowledge and enhance each student's opportunity to participate in civic engagement.

This case study clearly found evidence of students increasing their practical knowledge, faculty utilizing a different environment to teach, and local communities gaining a deeper sense of community resilience. Therefore, members of the Associated Schools of Construction should evaluate their curriculum and consider specific incorporation of post-disaster recovery service-learning content. Service-learning builds students' characters which greater equips our future generation of builders. The potential opportunity to add value to those in need due to devastation from disaster coupled with offering SL experiential learning to CM students is a union that has proven to be worth the work. The course instructor must also play a major role in managing expectations, clearly communicating to all stakeholders, executing thorough planning, and insuring stakeholder relations remain strong throughout the experience. Students expressed in their reflections of the course sincere gratitude to have been provided the opportunity to engage and contribute to the needs in the surrounding communities while strengthening themselves as construction managers.

The marriage of social ties and learning ties is deeply rooted and beautiful when executed properly. The relationship skills students build during their education matter for their future careers. As was identified in this study, the central focus of the developed course is learning from community partners, participating in real-world construction experiences, engaging in the world around them, and learning from social experiences. These types of experiences enhance learning and may better prepare construction management students for specialized careers in the construction industry.

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