As the construction industry evolves, the curriculum that prepares future builders must change and account for new ideas and concepts as well. In September of 2020, the Construction Management department at the California Polytechnic State University (Cal Poly) gave the opportunity to five senior level students to assist them with research on how to develop content and programming for the five extra student learning outcomes and have it count toward their senior project. These five students, each being paired up with a student from CM 461, were asked to produce a study guide and survey questions for one of the five student learning outcomes. The purpose of this paper is to give a more in depth understanding of the logistics and process behind the whole senior project for the leadership student learning outcome. The study guide was inspired by a detailed literature review, collaboration and opinions of other students, and a reflection of students’ own professional experiences. The study guide covers leadership ideals and skills that a leader should have in order to be successful in the construction industry. The goal is to equip students with the tools that assure they will be great leaders and succeed in the construction industry.

Keywords: Leadership, construction, education, industry, communication

Introduction

The Construction Management department at California Polytechnic State University (Cal Poly) is known for producing many distinguished industry professionals all over the state. The department is well rounded with great faculty who are willing to go out of their way for students, a wide variety of courses integrated into the curriculum, and a vast amount of professional opportunities as well. These three attributes contribute to the program for being recognized at a national level.

Over time, things change and in order to succeed, people must learn to adapt. This is no different for the construction industry. As the construction industry evolves, universities must also adapt to what the demands of the industry are. The most direct way in which universities can adapt is by reevaluating their learning outcomes and curriculum for the sake of producing well prepared students. Though COVID-19 has put the world to a new halt and caused many changes, the Construction Management department at Cal Poly decided to get the ball rolling in regards to developing more current content and programming for their own student learning outcomes. In September of 2020, the faculty recruited five students to do research and produce a set of deliverables that would contribute to content development and programming. Each student selected one learning outcome, was paired with a student enrolled in CM 461, and worked to create the deliverables.

The student learning outcome chosen that this senior project focuses on is leadership. Leadership is relative to a person’s individual assessment and understanding of what a leader does and the impact they create on a project. There are many different approaches and styles to leadership, but each style is composed of similar qualities. Having and understanding skills and ideas such as, technical skills, emotional intelligence, and diversity and inclusion are important for any type of leadership.
Leadership is vital for the construction industry and it is important students understand that as they are early in their careers.

**Process**

After a meeting with all the parties involved, the path to produce the deliverables was defined as a fluid yet direct one. Like any other senior project, milestones must be set. In the case of leadership, the senior project student, the CM 461 student, and the subject matter expert met biweekly and provided updates and drafts of the deliverables. The students accounted for feedback and input while adhering to their goals set. The deliverables to be produced were:

- **Study Guide** - A study guide inspired by the literature review and investigation done to define what makes a good leader and the importance of having leadership skills in construction.
- **Study Guide Questions** - The questions were inspired by the study guide and will ultimately be used for the students’ understanding. Ten multiple choice and ten free response questions were produced.
- **One Page Summary** - A one page summary that the department receives and understands the gist of what should be accounted for when creating content. It also incorporates the data from the joint survey sent out.

Once the deliverables were defined, the process became clear. Until the end of the quarter, both the senior level students and the CM 461 students would set goals to create the deliverables. In the context of leadership, a timeframe was heavily used to establish order and help work toward the finish line.

**Deliverables: Study Guide**

The study guide was the main deliverable for the senior project. It required the most attention, time, and dedication to create and assure that it would leave students with a better understanding of what makes a leader and how different aspects of leadership contribute to the individual and group success on a construction project.

In order to create the study guide, a few steps were taken. The first step was conducting a literature review that drew from various types of topics that all pertain to leadership. In terms of literature, peer reviewed articles and informative articles were the main source that fuel inspiration. About seven peer reviewed articles were used. Some of the topics that they covered were:

- **Leadership education in construction** - The importance of teaching leadership skills and attribute to students who are enrolled in Construction Management or similar undergraduate degree programs.
- **Organizational leadership** - Leadership relationships and dynamics in an organization and how they are rooted through a company’s goals, values, and visions.
- **Shared leadership** - The importance of leadership in a team setting. Shared leadership went into depth regarding how leadership impacts team performance and goals.
- **Emotional intelligence** - The relationship between emotional intelligence and leadership performance. Described how the Bar On model is used to recognize and encourage leadership attributes that define a well rounded leader.
- **Technical Skills and Knowledge** - The importance of knowledge and technical skills in leadership positions in the context of conflict, team member relationships, and performance.
● Diversity and Inclusion - As the world evolves, the construction industry must begin to break stereotypes. Breaking barriers and setting the tone begins with people in leadership positions.

After analyzing the information conducted, the next step was processing the information with the respective CM 461 student and pinpointing what the most important areas were. The students narrowed it down to three areas that the study guide would cover: emotional intelligence, diversity and inclusion, and knowledge and technical skills. The senior project student would then begin the next step, writing the study guide with the intention of assuring it will be a vital resource for students in the long run.

The format of the study guide must abide by the American Schools of Construction Proceedings Style and Formatting Guide for Publication. This is the format that must be used for any senior project paper, and the senior project director decided that it would be beneficial for the study guides to utilize this format as its base. For example, the first page of the study guide (Figure 1) includes the abstract and keywords as any other paper employing this format would.

Figure 1: First Page of the Study Guide (Olmedo, 2020)
The study guide was written with the intent that students will learn and understand the main areas of leadership that are vital to not just the construction industry, but in any organizational setting. With emotional intelligence, students will learn how crucial it is and the role it plays when an individual needs to communicate, collaborate, and find solutions with a group of people in an effective manner. Diversity and inclusion will teach students the significance of breaking stereotypes and realizing the benefits and need to implement diversity and inclusion strategies in the workplace. Technical skills and knowledge will teach students the importance of learning and how learning never stops. People learn so much through their careers so they are better leaders and now how to handle the inevitable situations that arise.

Deliverables: Study Guide Questions

The study guide was more oriented for the senior project student to write, while the CM 461 student took the lead in preparing the questions that go with it. A total of twenty questions were created, ten multiple choice, and ten free response questions. The goal for these questions were for future utilization in classes to make sure students are understanding the importance of leadership.

The ten multiple choice questions are based on the three main sections in the study guide. Some of the questions could be answered with common sense, but knowing the context and information reassures what the student knows. The ten free response questions are application oriented. The purpose of the free response questions is to have students think outside of the box, apply their prior knowledge, and reflect on what their own decisions would be in certain scenarios. For example, some of the study questions (Figure 2) are shown to be very open ended and realistic in the context of things that an individual should be asking themselves in the workplace.

![Figure 2: A portion of the free response study guide questions (Ayala, 2020)](image)

Ultimately, the questions aim to test the student’s abilities and indicate if they learned enough about leadership during their undergraduate career as a Construction Management student. With the current curriculum, and future content that will be developed, students in the Construction Management program have a path that favors the ability to learn leadership skills that are applicable in professional settings such as internships and student competitions. In the context of leadership, the goal of the Construction Management department is to produce graduates who already obtain the skills to be a good leader when they start working full time.

Deliverables: One Page Summary

The one page summary serves a purpose that is similar to an infographic, but it is more technical oriented. The one page summary’s purpose is to inform the department of the main points found from the research and investigation. The one page summary contains the abstract, keywords, and most important topics from the study guide along with data drawn from the results of the joint survey for all of the student learning outcome senior projects.
Structurally, the one page summary (Figure 3) was more fluid. As stated earlier, the one page summary contained:

- Abstract from the study guide
- Keywords from the study guide
- The gist of the most important topics
- Graphs based on the data drawn from the joint survey
- References from the study guide

Figure 3: One Page Summary (Olmendo, 2020)
The abstract was pulled directly from the study guide. Generally, the abstract is a brief summary of a research article, thesis, review, conference proceeding, or any in-depth analysis of a particular subject and is often used to help the reader quickly ascertain the paper's purpose. The keywords of a piece of work are used to help distinguish it from other work. The keywords typically revolve around the subject matter of the paper. For example the keywords for the study guide were leadership, construction, education, industry, and communication. The most important points were summaries of the main sections in the study guide.

The one page summary was challenging because it was one page. The amount of information that could have been placed does not equate to one page. Ultimately, the goal was to provide a deliverable where the Construction Management department can see the gist of the study guide and visualize the data for the future content development and programming.

Survey Results

The joint survey sent out for the student learning outcomes consisted of twenty questions, four per student learning outcome. It was sent out to current Cal Poly Construction Management students and Cal Poly Construction Management alumni. Of all the inquiries, about 35% were students, 30% were alumni, and 36% did not indicate. Appendix A contains the questions used for leadership specifically, but to generalize the types of questions asked, they consisted of:

- 2 questions required an answer from one of the choices given
- 1 question that required a ranking
- 1 question that was free response

In regards to skills, 56% said they felt leadership skills were in the most important, while 35% said management skills, and 10% said technical skills. 98% said yes to the question, “If undergraduate students are involved with organizations on campus and take up leadership roles or serve on student councils, will that experience help them in a professional setting?” while 2% said no. This is not surprising considering that many of the students in the Construction Management department have leadership positions either within the department clubs and organizations or are involved in other clubs or organizations on campus. About 52% stated “4” meaning they feel they go into the workplace proficiently prepared in the context of leadership. No one indicated “1”, meaning that for the majority of the students, the Construction Management curriculum is on the right track in preparing students for leadership positions in professional settings.

Most of the answers to the free response questions revolved around social development within the curriculum. For example, a student answered, “DEI training in how to be an interactive leader as well as a leader/manager who is educated in diversity and inclusion. Courses to properly explain and let students experience how to manage groups of people as well as be a part of large projects.” An alum answered, “Activities or curriculum that challenges students to solve problems in small teams would assist in preparing them for industry. This is especially true of interdisciplinary teams that include students from other majors like Architecture, Arch Engineering, engineering, etc. All construction projects require interdisciplinary teams to work together, and each team is a custom mix of companies that changes with every project, so the ability to recognize strengths, work habits, and tendencies in your teammates and assign responsibilities accordingly is extremely valuable to the team as a whole. Giving students multiple opportunities to solve problems as a team, and mixing up the makeup of each team, would be good practice for the professional industry.”. Through their answers, both groups advocated for more interdisciplinary work and involvement in areas that typically do not pertain to the
construction industry. Both groups advocate for these things because they fundamentally believe that it will make people better leaders in both an individual and group setting.

The feedback of both students and alumni was decided because both are valuable in their own ways. A student sees things with a modern point of view that is solely based on their experience as a student and mild level of professional experience through internships, volunteering, and involvement on campus. An alum has more experience to reflect on and compare to, especially if it has been a couple years since they have been out of school and focused mainly on the advancement of their own professional careers.

**Conclusion**

In September of 2020, the Construction Management department gave the opportunity to five senior level students to assist them with research on how to develop content and programming for the five extra student learning outcomes and have it count toward their senior project. These five students, each being paired up with a student from CM 461, were asked to produce a study guide and survey questions for one of the five student learning outcomes, along with a one page summary for internal use at the desire of the department.

The deliverables were executed with the hope that students who utilize them learn about leadership. The study guide aims to educate and inform on different areas that pertain to leadership and the role it plays in the construction industry. The study guide questions, aside from testing students’ knowledge, gives them the opportunity to reflect on what they know and should learn. The one page summary serves as the outline for ideas and thought for developing new and current content that parallels what is expected in a professional setting. Hopefully, all the deliverables will be utilized in the years to come and then again go through this same process when the time is right.

The goal of the leadership student learning outcome is to ultimately prepare students to be the best leaders they can be as their professional careers in the construction industry begin. As the construction industry evolves, the curriculum that prepares future builders must change and account for new ideas and concepts as well. So many companies are already beginning to develop diversity committees and other internal coalitions that push for a more progressive agenda. Therefore, if work is already being developed in professional settings, those same ideologies should at least be introduced to students before they embark on their professional careers. In order to make change, people must lead, and that is what the department strives for its students to become. Leaders that are agents of change for the benefit of construction and the people making it happen.
Appendix A - Survey Questions

1. Please indicate your status
   CM Department Alum or CM Department Student

2. When analyzing a professional position in the AEC industry, which do you think are more valuable?
   Technical Skills or Leadership Skills or Management Skills

3. Do you think the current Cal Poly CM Department curriculum prepares students to be leaders in professional settings?
   1-5; 1 meaning least prepared, 5 meaning well prepared

4. What kind of curriculum development/programming can the CM department offer that will contribute to leadership

5. If undergraduate students are involved with organizations on campus and take up leadership roles or serve on student councils, will that experience help them in a professional setting?
   Yes or No