

Building the Future of the Construction Industry through Academic Partners

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Academia and industry are always challenged to create sustainable connections. They both need each other; academia requires industry feedback for accreditation, and industry requires students as interns and graduates as employees. Students rely on both to create a lifetime of success. Research has been done to understand these relationships, but research was not found on specific solutions. There is not one answer, but rather a model that could be considered to create a sustainable collaboration for faculty development, program development and student experiential learning. Kiewit Corporation realized the need to better connect with academia and formed University Relations. It began with a faculty advisory board from which multiple programs were developed as per their areas of concern. The result was positive for both industry and academia. Data has been collected for over the past year to understand these benefits. This paper outlines the programs that have been developed and the metrics that measure the outcomes to date.

Key Words: Industry Collaboration, Student Learning Outcomes, Student Success

Introduction

Research results have revealed the importance of real world examples in Construction Management (CM) curriculum to help students acquire skills for success (Ahmed, Yaris, Farooqui, & Saqib, 2014; Mian, et. al., 2016). The definition of student success for this paper aligns with the academic expectations of the acquisition of desired knowledge, skills and competencies that lead to graduation and post-university performance (Braxton, 2006; Gonsalves & Vijaya, 2008; Jennings, Lovett, Cuba, Swingle, & Lindkvist, 2013; Perna & Thomas, 2006). As accreditation has moved towards a student outcomes based evaluation, it creates opportunities for collaboration with industry to enhance courses (Mehany & Gebken, 2016; Shavelson, Schneider, & Shulman, 2007). Student Learning Outcomes (SLOs) have been defined by the National Institute for Learning Outcomes Assessment as;

Student learning outcomes statements clearly state the expected knowledge, skills, attitudes, competencies, and habits of mind that students are expected to acquire at an institution of higher education.
(<http://www.learningoutcomesassessment.org>)

In the area of construction education, the American Council on Construction Education (ACCE) now has 20 SLO's for students to fulfil upon graduation (<http://www.acce-hq.org/>). Industry has been an active part of CM programs by serving on department advisory boards and participating on accreditation team visits. Researchers have collected data from industry to understand student competencies (Ahn, Annie, & Kwon, 2012; Behhart & Shaurette, 2012, and Wiesel & Badger, 2015).

Kiewit has transformed collaboration with industry and academia by introducing University Relations. The goal of University Relations is to enhance construction education by providing our academic partners with resources to support program, faculty, and student development. The programs were developed from the responses of a faculty advisory board members suggestions for faculty to increase their industry knowledge and obtain new materials for classes. An evaluation within Kiewit reviewed current practices related to university recruiting, faculty outreach, and university development to create programs that would enhance the best existing processes and introduce new concepts that were missing in the original gap analysis. Since 2015, programs have been developed, piloted, and evaluated for the impact that it has on student success. The results have been impactful from both the industry and academic perspectives.

Development of Programs

The first programs developed were piloted in 2015 and continued in 2016 and 2017. The programs were formed from the advice of a faculty advisory committee. The first initiatives included a workshop for faculty and a faculty internship program. They were developed to align with the goals of the company mission to provide outreach and stewardship while assisting faculty with their needs for connections to current topics in the construction industry. The explanation of the program development, facilitation and evaluation is outlined below.

Faculty workshop: Building a Stronger Curriculum with Kiewit (BSCCK)

May 2015, a workshop idea was developed. The plan was to pay for the travel expenses, lodging and food during the multi-day event. Unfortunately, introducing this in May overlooked the fact that many programs had already completed their semesters. It was decided to plan the event and hope for the best. Over 200 educators were contacted to participate in a free curriculum development and collaboration event. Thirty-six faculty from twenty-seven different institutions signed up and participated. The workshop included a site visit, shared sample curriculum best practices, and active educational sessions which afforded faculty a valuable opportunity to learn from Kiewit and from each other.

Upon completion of the event, 100% of the attendees completed a survey to evaluate the event. Because of the favorable feedback, the 2nd workshop was planned based on recommendations of the attendees. The second event was modified to include more active involvement of the faculty and more specific topics. Pre-work was also required for all faculty to complete before the workshop which was applied during the workshop. Additional resources from Kiewit were included by adding instructional tips sessions. A field trip was included that utilized lessons from the workshop on how to create an active exercise during the field trip. Table 1 outlines the attendees of each workshop and the areas of concentration.

Table 1: Building a Stronger Curriculum Workshop details

Date	Location	Topics	Number of attendees	Number of programs
June 2015	Houston, TX	Safety and Quality	36	28
June 2016	Cove Point LNG Project, MD	Estimating and Scheduling	31	25

Kiewit Faculty Scholar Program

It has been reported that CM programs continue to struggle with proving applied knowledge to students that align with the industry (Arian & Burkle, 2011; Mah, Arian, & Sharma, 2014). This collaboration was developed through a need to continually support the education of students in this industry. Faculty may have little industry experience or faculty may want to refresh their curriculum by adding new projects to their courses. This program is an investment in the future of the construction industry, by connecting faculty to professionals and experiencing hands-on the skills needed for successful projects of today. The experience will enable the faculty to intensify current curriculum by bringing new work experiences and relevant project materials into the classroom to enhance student learning. To help create faculty internships, the Kiewit University Relations introduced the Kiewit Faculty Scholars Program. The objectives for faculty attending this program include:

Enrich the classroom experience of construction and engineering students by providing opportunities for selected faculty members to gain relevant construction experience by interning with Kiewit. Participating in this program is an investment in the future of the construction industry, because current professional experience will enable the Faculty Scholar to be more effective in the classroom by being able to share recent and relevant work experiences.

Each educator will spend their Scholar Period (typically 10 to 16 weeks during the summer) on a construction project site or within an office working in design or operations support function. Internships will be assigned based on the alignment of the Faculty Scholar's expectations and company needs. The faculty member must identify the specific skills and knowledge to be gained during the internship, recognize needed professional work experience, and obtain support from the faculty member's institution (Department head or dean). University support refers to a letter of recommendation, and the approval of the activity to be part of the faculty's scholarly work. Detailed expectations of outcomes are outlined in the application process which includes the development of course materials as a deliverable during the internship. The Faculty Scholars Program also benefits company by providing quality temporary help on projects and if desired, feedback on management processes.

Table 2: Outlines the Timeline for Faculty Scholar Program

Dates	Details
September 15-December 15	Interested faculty will apply
December 16-January 1	Review all applications and match applicants
January 1-February 1	Faculty will interview with perspective employees
February 1	Faculty selected and notified.
March 1-15	Work plan development for faculty scholar
March 16-May 1	Meeting with Human Resources and appointed manager to review and approve work plan and expectations of internship.
May-August	Internship period
June 1	Faculty Scholar post one (1) year review (Survey Monkey)
June 15	Faculty Scholar/Manager mid-internship review (Survey Monkey)
August	Faculty Scholar/Manager exit review (Survey Monkey)
September 15	Faculty Scholar Summary Report Due
October 15	Faculty Scholar Learning Modules Due

Upon approval, the faculty and assigned manager would complete a work plan to outline the expectations of the experience. The work plan includes the following:

- Details of assignment (name, time period, location)
- People involved and contact information (Sponsor, Project Manager, HR, Intern)
- Objectives
- Owner / Supervisor
- Experiences / Activities
- Equipment / Access / Training
- Specific Tasks
- Travel or Location
- Weeks
- Work Location / Field Office

Outcomes of Programs

The company required an overview for upper management after one year to understand the return on investment of the programs. Although the original intent was to provide stewardship for the company, data indicated outcomes that were unexpected. The report was compiled during a time when the company was creating dashboards for data, this allowed for even more data to be analyzed.

Building a Stronger Curriculum with Kiewit (BSCK) Outcomes

From the first workshop, a one year after survey was sent via survey monkey. Attendees reported their program accreditation, results were 10 ABET, 12 ACCE, 2 ACTME and 1 other. There are some programs that have multiple accreditations so they were allowed multiple answers for this question. This was reported from 21 of the 36 faculty who had attended the workshop. A total of 28 of the 36 were accounted for, three have changed programs, one faculty had no email and three others were on some kind of leave (as indicated by their automatic email replies; health, maternity or sabbatical) and therefore did not respond to the survey. Faculty were asked if they utilized information from the workshop in the classroom and how many students were included in these classes.

Other data collected from the one year post workshop survey included:

- Average teaching of 13 years (range 3 to 25 years).
- Average experience of 16 years (range 4 to 25 years).
- 90.5 % of the responders used topics from BSCK in a lecture.
- 38.1 % of responders used topics from BSCK in a lab
- 63 different courses were reported to utilize topics (53 courses required by major)
- 5,227 students per year were in attendance of courses with topics
- 80% of the faculty attendees shared data with other faculty.

The open questions also revealed what attendees thought about “Did you connect to your students from attending the workshop?” These answers included some of the following quotes:

- “Changed my strategic vision of the higher education / industry relationships”
- “Yes, by communicating with alumni who are currently working on various Kiewit projects.”
- “Yes! The workshop helped me to identify ways in which I could better engage which my

students to introduce and enforce learning outcomes.”

- “Just talking with students considering employment/internships at Kiewit”
- “Learning more about what Kiewit does in the different areas helps me to recruit students to work for Kiewit”
- “Learning from other construction programs”

The outcome which was not anticipated is the number of students who showed interest in Kiewit and accepted offers. The integration of the recruiting department has been the most impactful of the data for one year. Seven of the programs attending the workshop had 100% of interested students accepting offers. This aligns with the belief that increasing student awareness resulted in a win for industry to hire and academia to increase real world examples in a class.

Faculty scholars program

The initial faculty scholars program began with two faculty experiences. In the summer of 2015, one faculty spent 10 weeks with managers in project controls. The goal of this experience was to better understand scheduling best practices to integrate into courses. Multiple projects were visited as part of the work. One outcome of this experience is that since then 5 students have been hired with no recruiting done on their campus.

The other faculty could only commit to a two-week experience. But if you relate that to a 16 week semester, that would be completing 2 – three credit hour lecture courses. They are usually 40 hours of contact per student. This experience resulted in 8 lectures which included videos, pictures and design drawing approved by the company. The specific areas included reinforced concrete design, concrete finishing techniques, rebar placement challenges, concrete materials testing techniques, formwork estimation, mass concrete calculations and measurements, and curing practices. These are all areas which are enhanced with real world materials.

In the summer of 2016, another faculty interned on the Highway 53 Relocation Project near Virginia, Minnesota. He worked with the quality manager to inspect work while maintaining data on project cost and schedule. Information from the experience was used to develop learning modules for his classroom and input into the Kiewit Faculty Switchyard portal. In the fall, his class took a field trip to site and experienced the vast complexity of the project that they had been studying in class. Dr. Diab quoted, “I was able to share new, creative ideas about how we delivered the project, and how we managed quality, risk, safety and scheduling.”

This program will continue to grow with outcomes for Kiewit including:

- Increase understanding of diverse market, job function, and geographic opportunities
- Activities/exercises that give students skill sets needed for successful work
- Realistic work expectations for students
- Building additional learning modules in Switchyard for use in curriculum
- Distinguish Kiewit from other clients and or competitors
- More experienced, temporary and affordable labor for project impact
- Competitive intelligence on industry best practices
- Research support and ideas for complex, time-intensive challenges

Sustaining Collaboration and Future plans

When the workshops and internships are completed, how does the collaboration continue going? In the past, even the advisory boards have difficulty maintaining forward momentum. To make this collaboration continue, Kiewit has

utilized recruiting software to create a portal as a one point of contact for all communication. The Switchyard portal connects faculty to Kiewit through:

1. Faculty requests: Field trips, guest speaking, gifts in kind, research collaborations, etc.
2. Curriculum support: Learning modules, case studies, videos, virtual tours, etc.
3. Event Planning: University events, recruiting events, recruiting events, etc.
4. Evaluation of Kiewit on campus
5. Personalized campus plans at each program level

This portal will allow university individuals to login and see what is happening across their campus, evaluate events, request from the company to visit and download education information. The education information is organized by the American Association of Construction Education (AACE) and references the Accreditation Board for Engineering and Technology (ABET). This material is open and available for use with any faculty, bringing highly relevant and current content into the students' experience. Faculty can choose from a wide array of courses on many different topics to fit their particular needs. Additionally, they can use the portal to upload and share curriculum, apply for a Faculty Scholar experience, schedule campus visits, request financial support, and even refer promising students to the recruiting team.

It's also important to stay in touch with attendees and continue to collaborate. This paper is an opportunity to continue the conversation as faculty members from different institutions and the industry partner are working together to disseminate information. New workshops will be developed to continue the connections from previous workshops. This uninterrupted and focused time to interact is invaluable for busy educators who are often too bogged down during the semester to do anything other than tread water.

Data is continuing to be analyzed. The latest impact number was that 57 % of the 78 applications for student program in fall 2016 were from departments with faculty who had some connections with the company programs. Another new program was implemented this year, 12 – 1st Fridays Conversations with Women in Construction. This program started in Oct 2016 and was open to academic and industry to discuss issues related to women in the industry. The hopes is that this one industry partner becomes a model for others industry partners to follow for collaboration with academia. The need for student success and building the future of the construction and engineering industry is a responsibility of all working together. Events with multiple industry partners have occurred now through Kiewit University relations and this is just the beginning.

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