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Boot Camps: A Review of the Pedagogy in Construction Education with an Exploratory Study on Implementation in Industry

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Educational content in the field of construction is delivered in numerous ways. One particular format is a type of short duration, intensive training known as a ‘Boot Camp’. Identifying the components of established industry boot camps to determine an idea of cost, content, format and method, and how these contribute to successful trainings will help facilitate the reproduction of these successes in other settings. This paper provides an overview of boot camps, including the various implementations across academia and industry. It utilizes the experiences of the author attending two separate industry boot camps, and the deployment of a brief survey in an attempt to determine the prevalence, format, and successful implementation of boot camp style trainings in industry settings. The initial results from the survey are limited, but coupled with the in-person observations made, a preliminary indication of implementation in industry is observed.

Key Words: Training, Boot Camp, Workforce Development, Construction Education

Introduction

Whether a construction industry employer training a new or existing employee, or an instructor at an institute of higher learning, the field of construction education is often faced with the particular problem of providing relevant, accessible, and critical content for a varying skill set, within dynamic settings. For employers, the selection of the type of knowledge that is transferred (either practical or theoretical), and how it is delivered (through formal or informal means) have been shown to play a significant role in the development and maintenance of a successful and competent employee (Detsimas, et al. 2016). Recent studies even indicate that whole team satisfaction is dependent on whether or not the new and existing workforce is provided access to relevant, and robust training (Welfare, et al. 2021). An important question to ask then is: How are companies leveraging educational methods to accomplish the goal of well-balanced trainings? Construction workforce education spending was approximately \$1.5 billion dollars in 2022, according to survey data from the Associated Builders and Contractors, and on-the-job and face-to-face training dominated the method

of content delivery (Associated Builders and Contractors, 2023). This would seem to indicate that, even with the prevalence and advancement in virtual training, that employers are sticking to a traditional format of content delivery. There is no additional information as to what modalities the face-to-face trainings may be presented in, which may be consistent with a general lack of available research on construction education training methods in use in the industry (Detsimas, et al. 2016). This paper examines the occurrences within the construction industry of a training format commonly known as a ‘Boot Camp’, i.e.: a short, intensive training designed to educate participants within a certain amount of time with the goal of acquiring a certain skill set. These types of trainings are becoming more frequent in many industries where a combination of skills is crucial to employee development and performance (Flores, et al. 2020). This paper also includes observations and findings from a study of existing construction education boot camps within the construction industry. The study aimed to experience boot camps in progress first hand to identify and analyze what made them successful, either as a whole, or as component parts. Additionally, the study attempted to quantify the actual implementation of these types of programs within the construction industry, and gather a rough idea of the costs associated with this type of training.

Boot Camps and Construction Education

Modern Educational Boot Camps

A boot camp is a type of basic training which is commonly known as a method to test and train new military recruits in an intensive and rigorous manner. This type of intensive training has been adapted for use in many subjects from fitness to computer programming. Most modern educational boot camps use the premise behind the military doctrine that intensive, focused, and content driven educational seminars can deliver a measured educational impact, in a limited amount of time (McKee Wiggins, et al 2022). Boot camps have probably enjoyed more notoriety and have been used successfully as a marketing tool for ‘coding’ in the information technology industry with promises of guaranteed employment post-graduation and rapid development, with some caveats (Lyon and Green, 2021). The computer programming industry is not a sole adopter though. The medical profession has been using boot camp pedagogy with some frequency as the technical nature of the industry often requires rapid onboarding and hands-on-learning to educate and maintain a competent and well-trained workforce (Berridge, et al. 2020).

Construction Education Boot Camps in K-12

From elementary to post-secondary, boot camps have grown in popularity as an alternative to formal educational strategies. As a way to create engagement and interest in STEM related activities, the traditional summer camp model has been used to create boot camp style interactive learning environments for middle-school and high school students (Gaedicke et al, 2016). These experiences frequently target students that may not have the opportunity to take part in hands-on learning in the construction industry. With topics ranging from estimating to safety, the intent of these camps is often to introduce this demographic to important segments of the industry, generate interest, and build confidence (Rokooei and Tafazzoli, 2020). Feedback from these events is typically positive and highlights the effect of working collaboratively within a peer group using a hands-on approach to learning (Yilmaz et al, 2010). An additional benefit from this type of learning may be a potential increase in post-secondary enrollment in construction related programs (Rokooei and Tafazzoli, 2020).

Construction Education Boot Camps in Higher Education

Two-Year Programs

Two-year programs are a natural fit for the short duration, intensive skills-based training consistently found in the boot camp format. The majority of these programs are designed to support new entrants into the field of construction, although eligibility does vary, an example of this being the program at Guam Community College. (Guam Community College, 2023). The durations are typically several weeks and may include more than one session. Some programs include the acquisition of a certificate upon successful completion of the program. Many of these types of programs are tuition-free and are supported through grants and partnerships with industry foundations that provide additional access to employment opportunities. (North State Building Industry Foundation, 2023).

Four-Year Programs

Four-year degree programs whether semester or quarterly may not be traditional grounds for hands-on intensive training methods, however there are programs that are using the pedagogy with great success and discovering the benefit of its flexibility and depth of study (Ricci, 2018). Another example of the benefits of the emerging trend of boot camp construction in higher education appears in a case study analyzing the benefits of a five-day construction management boot camp designed to prepare new enrollees in a graduate program, whereby participants were observed to have bridged skills gaps and benefited from the comradery created during the training (Rybkowski et al, 2019).

Construction Education Boot Camps in Industry

Trade Associations, Unions, Workforce Development Groups

Recognizing that a well-trained workforce is crucial to the industry, trade associations, unions and other workforce development groups offer many different types of training and formats. Some fit the boot camp model and offer intensive skills-based training for craft and management (Associated General Contractors of California, 2023). Additional modalities in use include formal mentoring programs, partnerships with industry, invitations to special 'days' where a focus is placed on a specific element of construction, such as concrete, or the creation of a multi-day educational forum where community members can participate in activities designed to pique interest in the trades and/or build skills (Barton Malow, 2023). These types of outreach are usually a combined effort among unions, companies, associations and local governments.

Construction Companies

A skilled labor shortage is not a new phenomenon in the North American construction industry, and has been in a repetitive cycle since the 1980's (Karimi et al, 2018). Recent studies implicating this skills gap as having a direct effect on project performance (Mohd Yusoff et al, 2021) may be prompting more employers to look more closely at their educational methods. Creating training programs to onboard new employees and provide ongoing training to a valued employee's career while also seeking ways to create a culture within that attracts and engages their employees are important considerations. The prevalence and format of these types of trainings in the construction industry is the focus of the author's study on construction education boot camps.

Exploratory Study of Construction Education Boot Camps in Industry

Methodology

This study of boot camp implementation in industry was made using two different methods. The first was through informal observations of two completely separate, and different company boot camps which were attended as an observer only. This was made entirely possible by invitation from the sponsoring companies. No interaction for the purpose of research was made with the campers, the instructors, or the camp facilitators, although conversations incidental to the program, including perceptions and attitudes regarding the content were had. Any observations made were done so within the context of the author's personal experiences with traditional construction education modalities whether in industry or in academia. A brief report was created and submitted to one of the sponsoring companies to provide feedback in their effort to improve their program.

The second part of the study was through the use of an eighteen-question survey that was deployed to recruiting construction companies at the author's university. The implementation of the survey required a standardized definition of what a boot camp was. For the survey, a boot camp was defined as: 'Intensive trainings that last from 3-7 days with a focus on a specific outcome or related outcomes.' The survey was not mandatory and was distributed via email. The survey was separated into four different sections with similar types of questions within each section.

1. Section 1: 'Company Overview Questions' which included basic questions about company demographics and required verification from the responding company of an existing training in place that fit the study's definition of a 'Boot Camp' in order to proceed with the survey (exclusion criteria).
2. Section 2: 'Training Information Questions' which included questions about the program in place, instructors used, and activities and types of trainings offered.
3. Section 3: 'Participant Information Questions' which included questions about the employee demographic targeted, attendance, and cost of trainings.
4. Section 4: 'Training Outcomes' which included questions about the desired outcomes of the training, and the use of any post-participation survey data in a quality improvement program.

Observations of Two Separate Industry Boot Camps

Observations made of two separate industry camps attended are grouped herewith into categories that were observed to form the core of the trainings provided. The intent of this study and the observations made was to focus on the method of implementation and perceived effectiveness of the training. It should be noted that both companies actively procure and accomplish an industry-relative percentage of self-performed work within their segments of industry and project portfolios. This is valuable in contextualizing the types of trainings that are offered within the boot camp format. The target demographic of the two camps observed appeared to be employees in their second or third year with the company, with an increasing role of responsibility.

Observations on Community and Culture

Both boot camps attended focused heavily on company culture and the creation of a community within the company. Evidence of this ranged from the opening of the training sessions made through the presence of or introductions by company executives throughout the scheduled events and

trainings, to a number of extra-curricular team-based activities either on-site or off-site. Both trainings were held at each company's respective headquarters, and campers were frequently introduced to all types of employees working on-site by virtue of this arrangement. Both camps were structured, but also maintained an informal feel to them, which helped promote a sense of family. Mutual respect, engagement, and professionalism were very present among both campers and camp facilitators.

Observations on Content and Delivery

The delivery of the content was largely similar between both camps. There was a mix of in-class discussions and hands-on exercises to maintain engagement among the cohort. The time frame of the training ranged between three to four days and was designed to last all day each day with breaks for meals. Both camps used a form of friendly competition to maintain engagement among participants and often included educational games although none involved the use of serious games. Both camps required the completion of 'homework' to be completed outside of scheduled training time. This strategy appeared to be very useful in creating accountability. In one camp observed, the use of a thematic element, and the grouping of participants reinforced this. For both trainings, the content delivered targeted many aspects of the companies' work, including tasks and trainings focused on self-performed elements (such as measurement and layout), as well as industry standard subjects such as safety, quality, and scheduling. Additional trainings were given on company specific software and workflows. Also observed was one company's use of the employees gathered to give a required training, in this case a safety certification.

Observations on Knowledge Transfer

A focus on knowledge transfer was a key component to each of the observed trainings. This was effectively accomplished through the use of all internal instructors at both camps. Most of the instructors were seasoned employees that were integral to the camp and had been part of the instructional element previously. This provided a well-executed and experienced discussion that was the backbone of the trainings. One of the camps used junior-level employees and previous participants to the camp as part of the camp's faculty which may have provided a more recognizable and relevant knowledge transfer to the campers. In addition to the campers' experience, these newer instructors were allowed to illustrate their knowledge, effectively closing the loop on their experiences, and reinforcing a strong sense of community and company culture.

Discussion of Deployed Survey and Preliminary Results

The survey was initially deployed via email to sixty-six companies that recruit at the author's university. Only fourteen responses were received. Of the fourteen responses received, only five of those were able to fully complete the survey due to the exclusion criteria which required an existing training to be in place that met the survey's definition of a boot camp. Few responses were received for cost information about the camps and therefore, observations on cost are not included here. Regardless of the small sample size, data from the survey was found to be useful and added context to the in-person observations made. The findings from the study, therefore, should be considered preliminary.

Findings on Target Demographic

The survey results support the observation made that this type of training is predominantly geared towards entry and junior-level employees. However, the use of the boot camp as a multi-level training tool to support employee growth and development at all stages of an employee’s career is implied (see figure 1). The lack of administrative training provided also indicates the use of boot camps as a method to educate employees in operations-based tasks, focusing on typical entry-level roles such as a field engineer (see figure 2).

10. WHAT IS THE TARGET DEMOGRAPHIC OF PARTICIPANTS IN THESE STYLE OF TRAININGS?
CHECK ALL THAT APPLY.

5 responses

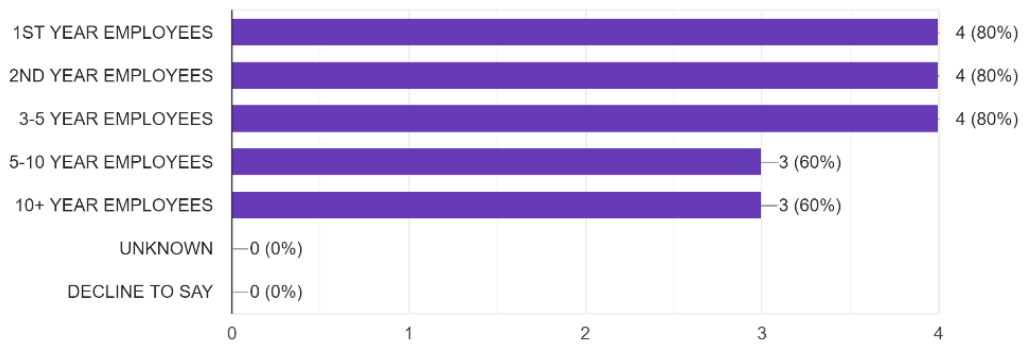


Figure 1. Industry survey question 10

6. WHAT JOB DESCRIPTIONS ARE A FOCUS OF YOUR COMPANY’S BOOT CAMP TRAININGS?
CHECK ALL THAT APPLY :

5 responses

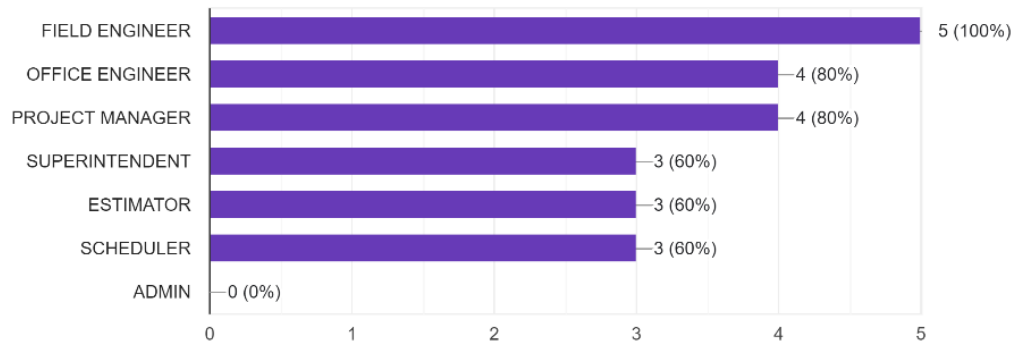


Figure 2. Industry survey question 6

Findings on Community, Culture, and Content

Echoing the observations made in person that indicated a strong sense of community and event-based learning exists at the core of these trainings, the evidence of extra-curricular trainings including social events on and offsite in boot camps was present in all question respondents. As a desired and targeted outcome, company culture was second only to basic concepts and critical knowledge when the top three choices across categories were isolated for frequency of selection (see figure 3).

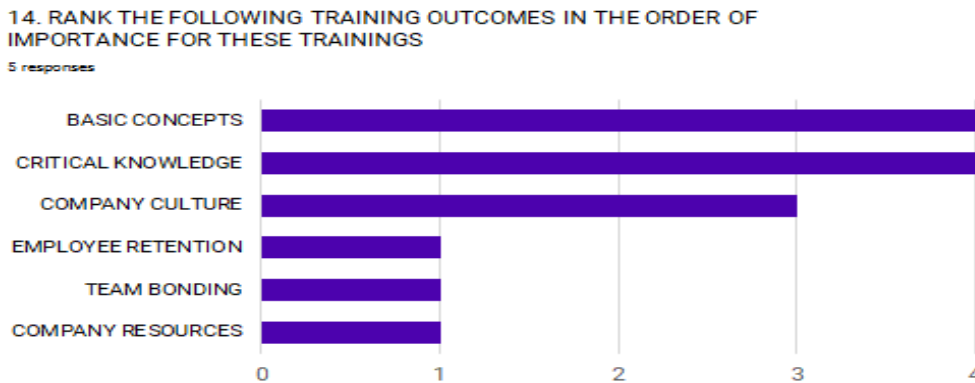


Figure 3. Industry survey question 14

Findings on Knowledge Transfer

The observations made on the use of internal instructors as integral to successful knowledge transfer continued to be supported from survey data. All respondents indicated the use of senior-level internal instructors with minimal use of outside hires. There was also an indication of the use of junior-level instructors, implying the belief that peer-group instruction is a highly-valued and effective method (see Figure 4).

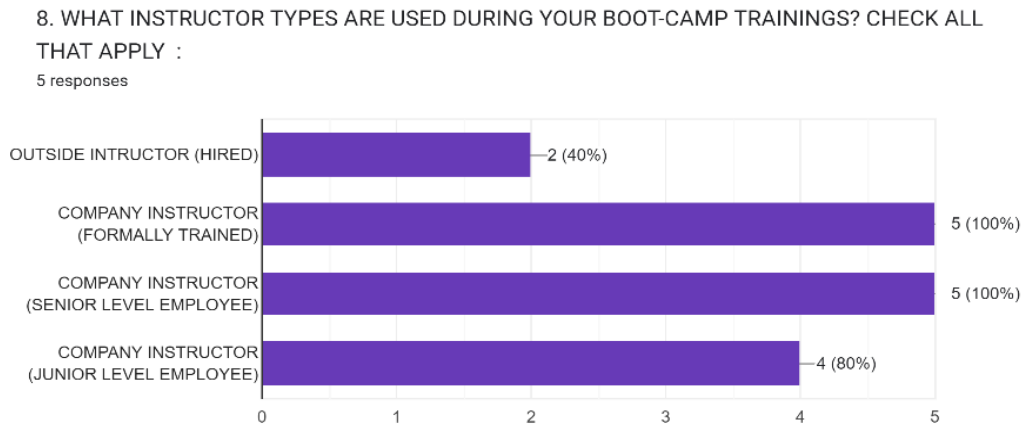


Figure 4. Industry survey question 8

Summarization of Findings and Takeaways

The results of the survey, while limited, echo the observations made in person. The construction industry is seeking to transfer knowledge to new and developing employees in a way that is meaningful, within the context of the industry, and aligning with the culture of the company and its values. The loss of critical institutional knowledge is becoming a very pressing issue in the construction industry, and construction companies will need to be willing and able to dedicate significant resources into training current and future employees (Detsimas et al, 2016). Successful training and knowledge transfer appear to be about the content and the delivery. The most powerful tool for delivery may be the creation of a community during the training (Rybkowski et al, 2019). The types of training and the way they are implemented will be key elements in the future of construction (Mckinsey Global Institute, 2017). Boot camp pedagogy has a unique combination of community and knowledge transfer that can create powerful learning experiences. The benefits of implementing a boot camp style type of pedagogy likely outweigh the costs and are worth exploring regardless of which segment of the construction education industry one is in.

References

- Associated General Contractors of California (2023, November). "Construction Project Management Bootcamp Part I & II (AGC of California)." *AGC of California*. Retrieved from: <https://www.agc-ca.org/training-education/construction-project-management-bootcamp-part-i-ii-2/>.
- Bartonmalow.com. (2023, November). "Workforce Development." *Barton Malow*. Retrieved from: <https://www.bartonmalow.com/about-us/diversity-equity-inclusion/workforce-development/>.
- Berridge, C., S. Jain, and C. S. Biyani. 2020. "Defining Boot Camp: A Supporting Literature Review." *South-East Asian Journal of Medical Education* 13(2):3. doi: [10.4038/seajme.v13i2.204](https://doi.org/10.4038/seajme.v13i2.204).
- Detsimas, Nicole, Vaughan Coffey, Zabihullah Sadiqi, and Mei Li. 2016. "Workplace Training and Generic and Technical Skill Development in the Australian Construction Industry." *Journal of Management Development* 35(4):486–504. doi: [10.1108/JMD-05-2015-0073](https://doi.org/10.1108/JMD-05-2015-0073).
- Flores, Saul, Dorene Balmer, Erin Pete Davidson, Danny Castro, Brian Rissmiller, Beatriz Varman, and Satid Thammasitboon. 2020. "A Scoping Review of Boot Camps as a Transition, or Induction Training in Health Professions Education."
- Gaedicke, Cristián. 2016. "Promoting Construction in K-12 STEM Education Through an Innovative University-Based Summer Camp."
- Guam Community College. (2023, November). "Construction Boot Camp." *Guam Community College*. Retrieved from: <https://guamcc.edu/construction-boot-camp>.

- Karimi, Hossein, Timothy R. B. Taylor, Gabriel B. Dadi, Paul M. Goodrum, and Cidambi Srinivasan. 2018. "Impact of Skilled Labor Availability on Construction Project Cost Performance." *G10.1061/(ASCE)CO.1943-7862.0001512*.
- Lyon, Louise Ann, and Emily Green. 2021. "Coding Boot Camps: Enabling Women to Enter Computing Professions." *ACM Transactions on Computing Education* 21(2):1–30. doi: [10.1145/3440891](https://doi.org/10.1145/3440891).
- McKee Wiggins, Luke, M. Mujeeb Zubair, Dominic Emerson, and Richard W. Kim. 2022. "Does a Boot Camp Expand Skills Rapidly?" *JTCVS Open* 10:293–95. doi: [10.1016/j.xjon.2022.01.026](https://doi.org/10.1016/j.xjon.2022.01.026).
- Mckinsey Global Institute. (2017, February). "Reinventing Construction through a Productivity Revolution." *Mckinsey*. Retrieved from: <https://www.mckinsey.com/capabilities/operations/our-insights/reinventing-construction-through-a-productivity-revolution>.
- Mohd Yusoff, Nurul Safwah, Faizul Azli Mohd Rahim, and Loo Siaw Chuing. 2021. "The Relationship Of Skilled Labour Shortages And Project Performance In Construction Industry: A Conceptual Framework." *Journal of Project Management Practice* 1(1):1–21. doi: [10.22452/jpmp.vollno1.1](https://doi.org/10.22452/jpmp.vollno1.1).
- North State Building Industry Foundation. (2023, November). "Sierra College Bootcamp." *North State Building Industry Foundation*. Retrieved from: <https://www.biaworkforce.com/sierra-college-bootcamp.html>.
- Ricci, Daniel. 2018. "Innovative Education Offered in Construction Management Boot Camps." *College of Health and Human Sciences*. Retrieved from: <https://chhs.source.colostate.edu/innovative-education-offered-in-construction-management-boot-camps/>.
- Rokoeei, Saeed, and Mohammadsoroush Tafazzoli. 2020. "Evaluation of the Impact of a Summer Construction Camp on Participants' Perceptions." P. 34606 in *2020 ASEE Virtual Annual Conference Content Access Proceedings*. Virtual On line: ASEE Conferences.
- Rybkowski, Zofia K., Shannon Degenhart, and Boong Yeol Ryoo. 2019 "Assessment of an Experimental Five-Day Graduate Student Construction Science 'Boot Camp' at a Research-Intensive University: A Case Study."
- Welfare, Katherine, Fred Sherratt, and Matthew Hallowell. 2021. "Perceptions of Construction Work: Views to Consider to Improve Employee Recruitment and Retention." *Journal of Construction Engineering and Management* 147(7):04021053. doi: [10.1061/\(ASCE\)CO.1943-7862.0002057](https://doi.org/10.1061/(ASCE)CO.1943-7862.0002057).
- Yilmaz, Muhittin, Jianhong Ren, Sheryl Custer, and Joyce Coleman. 2010. "Hands-On Summer Camp to Attract K–12 Students to Engineering Fields." *IEEE Transactions on Education* 53(1):144–51. doi: [10.1109/TE.2009.2026366](https://doi.org/10.1109/TE.2009.2026366).