

# Construction Management Academy Career Exploration Program: Strategy for Recruitment of Under-Represented Minority Groups

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Research indicates that the current construction industry does not have a good reputation in the overall job market and that young students are not aware of the preparation and education necessary to set them on a construction career path. During summer 2016, a Department of Construction Science at a large university in Texas offered a series of (eight total) five-day Construction Management Academy Career Exploration Programs for current high school students. The programs leveraged the power of higher education to focus on the social, intellectual, and emotional development of rising and admissible under-represented youths aged 14 to 17. The goal of these sessions was to acquaint students with the study of and potential careers within the construction industry. Also, a schedule of modules was developed to closely follow the course curriculum currently used by Construction Science students. Students were exposed to plan reading, estimating, scheduling, project management, construction technology, personal protection and equipment safety, CPR, Lean construction–focused simulation games, construction site visits, construction company office visits, and a university campus visit.

**Key Words:** Construction Management, Under-Represented Minorities, Recruitment, Lean Simulation Game, Building Information Modeling

## Introduction

Research indicates that the current construction industry does not have a good reputation in the overall job market (Barthorpe et al., 2000; Kashiwagi & Massner, 2002; Clarke & Boyd, 2011; Ling & Ho, 2013). Research has shown that the construction image problem can be attributed to a lack of knowledge and information about the industry, career opportunities it can offer, and required qualifications (Agaipou, 2002; Fielden 2000; Bilbo et al., 2009; Escamilla et al., 2016). It is imperative that students prepare properly to enter the workforce and careers in the construction industry. Young people need to know the career options offered by the construction industry. Construction employers must focus on attracting and retaining younger generations to keep pace with current and future industry demands.

## Background

Hispanic workers play a central role in the US construction industry and have a remarkable impact on US construction activities. As seen in Figure 1, 27.3% of construction workers in 2014 were of Hispanic or Latino ethnicity—the number of Hispanic employees in the construction industry is higher than in any other industry (Bureau of Labor Statistics, 2015). While Hispanics account for more than 45.5% of construction laborers, only

about 12.9% of construction managers are Hispanic (Bureau of Labor Statistics, 2015b). According to current research, Hispanics are over-represented in the construction industry (National Council of La Raza (NCLR), 2013). Only 6% of Hispanics in the construction industry make up only 6% of Bachelors' or higher degree. Also, 46% of Hispanics in the construction sector hold less than a high school diploma (CPWR Data Center, 2010). The low educational attainment can be attributed to the fact that they lag behind every other population group in attaining bachelor's degrees (Fry, 2002).

The critical need for a sustainable construction workforce has not been positively impacted by the increased population of women in the labor force; as a result, women remain under-represented in construction careers (Menches and Abraham, 2007; Wangle, 2009; Sang & Powell, 2012). According to the Bureau of Labor Statistics (2015a), out of 9,935,000 people working in all construction jobs, women constitute just 9.3% percent of them. In particular, women comprise only 6.7% of construction managers (Bureau of Labor Statistics, 2015b).

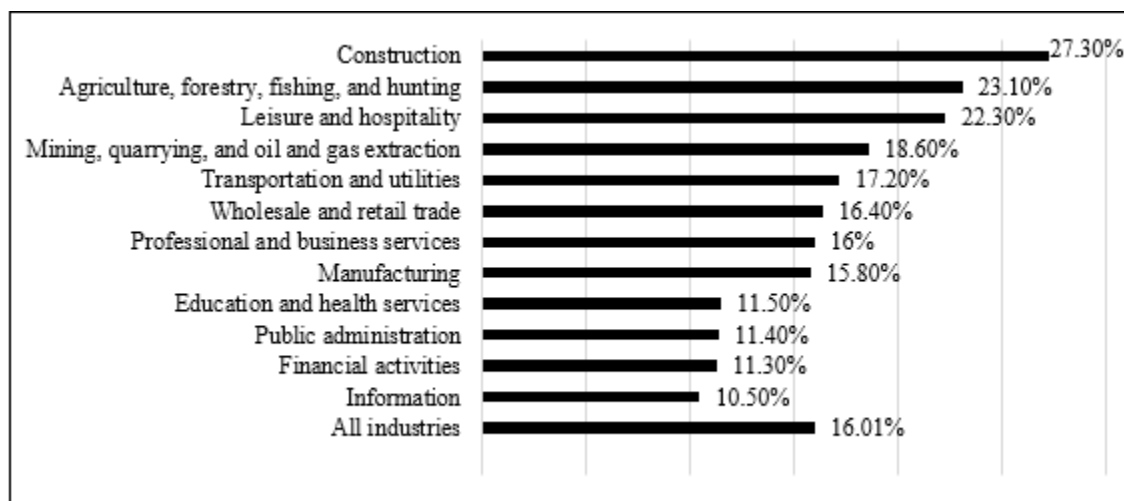


Figure 1. Percentage of Hispanic Employees by Industry (2015).

By recruiting Hispanic students with emphasis on women into construction management programs, the Academies will be able to address a lack of diversity among construction industry managers in Texas. As a result, the Construction Management Academy Career Exploration Program was developed to prepare young Hispanic men and women—as under-represented minorities—for successful careers and future leadership roles in construction and construction-related industries. The purpose of this paper is to describe a researched based Construction Management Academy program to change the negative perceptions toward construction industry careers.

### Construction Management Academies

During summer 2016, a Department of Construction Science at a large university in Texas leveraged the power of higher education and offered a series of (eight total) of five-day Construction Management Academy Career Exploration Programs for current high school students. These Academies focused on the social, intellectual, and emotional development of rising and highly admissible under-represented youths aged 14 to 17 years. The Construction Management Academy aimed to implement several purposes:

- 1) Defining and demonstrating “What Is Construction Management” as a career for potential students and future interns and employees in the construction industry

- 2) Providing opportunity for outreach and engagement in communities where construction companies work
- 3) Supplying opportunities to pursue post-secondary college access for underrepresented minority students
- 4) Changing the negative perception of the construction industry by exposing students to industry representatives

These Construction Management Academies enrolled 216 high school juniors from 19 school districts in South Texas, with 40% female participation. The Academies were developed through the coordination of various parties and partnerships including the construction industry, a large university's Department of Construction Science, Gaining Early Awareness and Readiness—Undergraduate Program (GEAR-UP IV), local school board members, family units, and the university's Prospective Student Center in Laredo, TX. Contributions from GEAR-UP IV totaled \$105,000, and \$73,000 contributed by seven Construction Industry Advisory Council (CIAC) construction companies including Bartlett Cocke General Contractors, Brandt Mechanical, Joeris, Marek Brothers Systems, Inc., Satterfield & Pontikes, SpawGlass, and Urban Oaks Builders. The program cost for (8) - 5-day Construction Management Academies totaled \$162,000.

The Tuesday, Wednesday and Thursday portions of the Construction Management Academies were offered in Laredo and La Joya, TX. The following sections describe the activities performed as part of each Construction Management Academy.

### *Tuesday Program*

Students and their parents were invited to an orientation dinner on the first night of each session. Instructors provided an introduction to the Construction Management Academy program and the Construction Science major. During these sessions, a short, self-administered survey was conducted among students. The purpose of the survey was to obtain the views and understanding of the student sample about construction management at the beginning of the study. The survey was reviewed and approved by the university's Institutional Review Board (IRB). The total number of participants who had parental permission to complete surveys was 162. After filtering and pairwise deletion, the actual response for each question varied from  $n = 51$  to  $n = 147$ .

The first question tried to discover student plans to continue education after high school. Only 2.82% of participants reported that they do not plan to pursue any further education (See Table 1).

Table 1: Student plans to continue education after high school ( $n = 142$ )

Answer Options	Response	
	Percentage	Response Count
Yes	97.18%	138
No	2.82%	4

Another question asked respondents about their plans for further education. The results show that a vast majority of students (85.03%) plan to attend a four-year college. 10.20% plan to enter community college to take their core courses and then transfer to a four-year institution. 1.36% plan to attend a two-year college. 2.72% plan to join the military. 0.68% plan to earn an online degree. 0.00% plan on entering a trade school/apprenticeship program (see Table 2).

Table 2: Student Plans for Further Education ( $n = 147$ )

Answer Options	Response Percentage	Response Count
Two-year college/community college to receive an associate's degree	1.36%	2
Two-year college/community college to take core courses and then transfer to a four-year institution	10.20%	15
Four-year university	85.03%	125
Online college degree	0.68%	1
Military service	2.72%	4
Trades school / apprenticeship	0.00%	0

The next question tried to ascertain whether the students had taken any construction courses in high school, to which the majority (64.33%) responded in the negative (Table 3).

Table 3: Students participation in a Construction course in their high school (n=143)

Answer Options	Response Percentage	Response Count
Yes	35.66%	51
No	64.33%	92

The next question asked participants to “Imagine if you did not attend the Construction Management Academy; how likely would you have been to pursue a career in the Construction Industry?” A statistical analysis was conducted to test for a significant difference between the answering tendencies of students who had participated in construction-related courses in high school and those students who had not participated in construction-related courses in high school. A two-sample Wilcoxon/Kruskal Wallis test was conducted to show significance. Results illustrate a difference in scoring tendency between students with experience in construction-related course and students without experience in construction-related courses. Results indicate a p-value of 0.0082, statistically significant at a level of 5%. In other words, students with a history of construction-related courses showed a higher tendency to Strongly Agree in comparison to their counterparts without a history of construction-related courses. The results for the stated question are shown in (Table 4).

Table 4: Pursue a Career in the Construction Industry (n = 231)

Answer Option	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
Imagine if you did not attend the Construction Management Academy, how likely would you have been to pursue a career in the construction industry?	8.57%	27.86%	49.29%	14.29%

The students who responded in the affirmative had to choose the construction industry-related courses they had taken from a list. The options included: architectural drafting, construction management, carpentry, welding, and agriculture. The breakdown of the responses for the question are shown below in (Table 5).

Table 5: Choose courses that you took that are construction industry-related  
(n = 51)

Answer Options	Response Percentage	Response Count
Architectural Drafting	37.25%	19
Construction Management	29.41%	15
Carpentry	25.49%	13
Welding	35.29%	18
Agriculture	29.41%	15

Responses to the statement, “How confident are you that participating in the Construction Management Academy will make a positive impact on your career choice?” are more inclined to the positive side, as only 6.16% of the respondents reported “Slightly” or “Not at All.” The distribution of results shown below in (Table 6).

Table 6: Construction Management Academy Impact (n = 146)

Answer Option	Not At All	Slightly	Somewhat	Moderately	Extremely
How confident are you that participating in the Construction Management Academy will make a positive impact on your career choice?	2.05%	4.11%	18.49%	41.78%	33.56%

### *Wednesday Program*

Wednesday activities included an introduction to Construction Science, teaching plan reading and estimating, and playing Lean simulation games.

#### *Introduction to Construction Science*

During this session, instructors aimed to provide students with a basic understanding of different aspects of construction project delivery, including project management, project scope, time, cost, quality, and resource constraints. Also, important issues were addressed such as construction career options and student expectations during their education.

#### *Plan Reading and Estimating*

Instructors provided participants with an awareness of the foundations of construction cost estimating. They also taught on interpreting the information contained in construction drawings and specifications.

#### *Lean Simulation Games*

Lean simulation games are effective tools for increasing student involvement and excitement, as well as providing learning through experience (McManus et al., 2007; Dukovska-Popovska et al., 2008; Rybkowski et al., 2012). During the Lean simulation games, students focused on improving decision making, people management, and overall principles. Also, participants exercised ways for reducing waste in the production process (Askariyeh, & Arhami, 2013; Vallamsundar et al., 2016; Sadeghi et al., 2016).

### *Thursday Program*

Thursday teaching topics included scheduling, cardiopulmonary resuscitation (CPR), and construction technology.

### *Scheduling*

During the scheduling session, the instructor taught students the fundamentals of project scheduling and the importance of a schedule for construction projects. The students were given 20 minutes to play project management games (Robc, 2016) with iPads, providing a quick and straightforward approach to understanding project management.

### *CPR*

Employee safety is one of the biggest challenges in the construction industry (McGraw-Hill Construction, 2013). With 18% of fatal injury cases, the construction sector represents the greatest fatality rate across various sectors (Bureau of Labor Statistics, 2013). In addition to the considerable number of fatal injuries, the construction industry also suffers from a high rate of non-fatal injuries (Levin, 2008). The goal of the CPR session was to acquaint students with first aid, CPR, and an automated external defibrillator (AED). In addition, instructors provided basic training associated with proper fall protection and personal protective equipment (PPE).

### *Construction Technology*

Using advanced technology is on the rise in many industries (Tofighi Zavareh et al., 2016), the construction industry being no exception. For the construction technology session, instructors described the transition from paper-based linear processes to a collaborative digital approach with Building Information Modeling (BIM). Some of the many advantages of using the BIM process were also explained (Lim et al., 2015; Shahsavari et al., 2015). Finally, students experienced visualizing 3D BIM models in augmented and virtual reality using the SmartReality+ application on iPads for the first time.

### *Friday Program*

On Friday morning, students, their parents, and high school counselors traveled to either Houston or San Antonio to visit construction company headquarters, where company representatives gave them firsthand accounts of what construction managers do. Family units play a fundamental role in high school students decisions for career choice (Wong & Liu, 2010; Jones, 2012; Kisi, 2013). The research concludes that family units know little about career pathways in the construction industry or what kind of preparation or education is requisite for the desired career path (Escamilla et al., 2016). The family unit performed a significant role in the outreach goals of the program, with 70 parents making the construction company office visits with the students. After company site visits, they traveled back to College Station, where students had the opportunity to stay in a university campus residence hall and enjoy meals in a student dining hall to experience college life.

### *Saturday Program*

During the program's final day, students visited the Department of Construction Science program, they were then taken on a tour through the campus and finally were able to meet and ask questions with university financial aid representatives. Ultimately, \$216,000 in scholarships was pledged to incentivize students to apply to the Construction Science program at the university.

## Conclusion

More than 200 students from predominantly Hispanic South Texas high schools spent a week learning about possible career paths while attending the summer 2016 Construction Management Academy, designed and led by faculty and industry professionals. The primary mission of the Construction Management Academy Career Exploration Program was to prepare young men and women for successful careers and future leadership roles in construction and construction-related industries. The Academies were developed and conducted through the coordination of various parties and partnerships including the construction industry, a large academic institute in Texas, GEAR-UP IV, local school board members, and family units. Follow-up will be done as these students prepare to graduate and continue toward their educational goals after high school. A survey will be administered to the entire student cohort that attended the Academies to measure the impact of the Academies on the students' choices for career path. This initiative represents only one possible opportunity or solution to electrifying those under-represented groups with what Construction Science departments can offer them and their future. What are other construction programs doing? What have been the successes and failures for them? What data/measurements are they tracking? There is so much unknown in this area, and the Associated Schools of Construction (ASC) could provide academic leadership in identifying, developing, and communicating real solutions to an age-old problem. Once we have them, how do we keep them? How do we respond to the unique difficulties encountered by this group of students?

A continuous, coordinated effort is essential to maximize the incoming resources available to each construction management program. The ASC would be better served through the development of a recruitment and retention committee comprising program and industry members focused on meeting the needs of the greater construction industry. Current programs that aim to increase student diversity into their construction management programs lack input on best practices and success measurement by peer institutions facing similar circumstances. It is recommended that the ASC put in place a committee that can develop strategies to approach the need for an educated and diverse construction workforce.

## References

- Agapiou, A. (2002). Perceptions of gender roles and attitudes toward work among male and female operatives in the Scottish construction industry. *Construction Management & Economics*, 20(8), 697–705.
- Askariyeh, M.H. & Arhami, M. (2013). Projecting emission reductions from prospective mobile sources policies by road link-based modeling; *Int. J. Environ. Pollut.* 2013, 53(1/2), 87-106
- Barthorpe, S., Duncan, R., & Miller, C. (2000). The pluralistic facets of culture and its impact on construction. *Property Management*, 18(5), 335–351.
- Bilbo, D., Lavy, S., Myres, D. J., & Waseem, M. (2009a). Sources of High School Juniors' and Seniors' Perceptions of the Construction Industry. *Journal of the American Institute of Constructors*, 33(2), 3-10.
- Bureau of Labor Statistics. (2015). Hispanics and Latinos in industries and occupations. Retrieved October 6, 2016, from <http://www.bls.gov/opub/ted/2015/hispanics-and-latinos-in-industries-and-occupations.htm>

Bureau of Labor Statistics. (2015a). Employed persons by detailed industry, sex, race, and Hispanic or Latino ethnicity. Retrieved October 4, 2014, from <http://www.bls.gov/cps/cpsaat18.pdf>

Bureau of Labor Statistics. (2015b). Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity. Retrieved May 11, 2014, from <http://www.bls.gov/cps/cpsaat11.pdf>

Bureau of Labor Statistics. (2013). National Census of Fatal Occupational Injuries in 2012. Retrieved October 4, 2014, from <http://www.bls.gov/news.release/pdf/cfoi.pdf>

CPWR Data Center. (2010). Educational attainment and internet usage in construction and other industries. The Construction Chart Book. Retrieved June 20, 2014, from <http://www.cpw.com/sites/default/files/publications/CB%20page%2030.pdf>

Dukovska-Popovska, I., Hove-Madsen, V., & Nielsen, K. B. (2008). Teaching lean thinking through game: Some challenges. 36th European Society for Engineering Education (SEFI) on Quality Assessment, Employability & Innovation.

Escamilla, E., Ostadalimakhmalbaf, M., Bigelow, B. (2016). Factors Impacting Hispanic High School Students and How to Best Reach Them for Careers in the Construction Industry. *International Journal of Construction Education and Research*, 10.1080/15578771.2015.1077296, 1-17.

Fielden, S. L., Davidson, M. J., Gale, A. W., & Davey, C. L. (2000). Women in construction: The untapped resource. *Construction Management & Economics*, 18(1), 11–3121.

Fry, R. (2002). Latinos in higher education: Many enroll, too few graduate. Washington, DC: Pew Hispanic Center Report.

Jones, S. (2012). Parental influence on young adults' vocational choices. *University of Kentucky*, Retrieved from <http://www.uky.edu/~drlane/ssca12/jones.pdf>

Kashiwagi, D. T., & Massner, S. (2002, April). Solving the construction craft person skill shortage problem through construction undergraduate and graduate education. ASC Proceedings of the 38th Annual Conference, Blacksburg, Virginia.

Kisi, K. (2013). Career Decision-Making Difficulties among High School Students: From the Perception of Career Counselors and High School Principals. Dissertation, University of La Verne, June, 2013. Retrieved August 18, 2015, from <http://search.proquest.com/docview/1437648271>

Levine, L. (2008). Worker Safety in the Construction Industry: The Crane and Derrick Standard. Report for Congress RL-34658, Congressional Research Service (CRS), Washington, DC.

Lim, Y.-W., Shahsavari, F., Azli, N. F. M. N., Ossen, D. R., & Ahmad, M. H. (2015). Developing a BIM-based Process-driven Decision-making Framework for Sustainable Building Envelope Design in the Tropics. In *International Conference on Building Information Modelling (BIM) in Design, Construction and Operations*. Bristol.

Ling, F. Y. Y., & Ho, S. W. K. (2012). Understanding and impressions of jobs in the construction industry by young adults in Singapore. *Journal of Professional Issues in Engineering Education & Practice*, 139(2), 109–115.

McGraw Hill Construction. (2013). *Safety Management in the Construction Industry: Identifying Risks and Reducing Accidents to Improve Site Productivity and Project ROI*. Bedford, MA: The McGraw-Hill Companies, Inc.

McManus, H. L., Rebentisch, E., Stanke, A., & Murman, E. (2007, June). Teaching lean thinking principles through hands-on simulations. Paper presented at the 3rd International CDIO Conference, MIT, Cambridge.

Menches, C. L. & Abraham, D. M. (2007). Women in Construction Tapping the Untapped Resource to Meet Future Demands. *Journal of Construction Engineering and Management*, 133(9), 701-707.

Mora, M. T. (2015). The increasing importance of Hispanics to the US workforce. *Monthly Labor Review*.

National Council of La Raza. (2013). Latinos in construction facts and figures. *Monthly Latino Employment Report*

Robc. 2016. The Project Management Game: Test your Skills as a Project Manager. Retrieved June 20, 2014, from <http://thatpmgame.com>

Rybkowski, Z. K., Zhou, X., Lavy, S., & Fernández-Solís, J. (2012). Investigation into the nature of productivity gains observed during the Airplane Game lean simulation. *Journal* 2012 pp, 78, 90.

Sadeghi, S. A., Karava, P., Konstantzos, I., & Tzempelikos, A. (2016). Occupant interactions with shading and lighting systems using different control interfaces: a pilot field study. *Building and Environment*, 97, 177-195.

Sang., K., and Powell., A. (2012) Gender inequality in the construction industry: Lessons from Pierre Bourdieu In: Smith, S.D (Ed) Procs 28th Annual ARCOM Conference, 3-5 September 2012, Edinburgh, UK, Association of Researchers in Construction Management, 237-247.

Shahsavari, F., Wah, L. Y., & Eftekhari, A. (2015). Integration of Building Information Modeling (BIM) With Green Retrofit Design in Malaysia. In International Joint-Conference of SENVAR-iNTA-AVAN.

Tofighi Zavareh, A., Barajas, O., Serafino, M., Jo, J., Applegate, B., Sadler, B., Hoyos, S. (2016). "A Novel Continuous Time Ternary Encoding Based SS-OCT Calibration." 2016 IEEE Biomedical Circuits and Systems Conference (BioCAS), Beijing, China.

U.S. Census Bureau. (2010). 2006-2010 American Community Survey. Retrieved May 20, 2014, from [http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?\\_afpt=table](http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?_afpt=table)

Vallamsundar, S., Askariyeh, M., Zietsman, J., Ramani, T., Johnson, N., Pulczinski, J. C., & Koehler, K. (2016). "Maternal Exposure to Traffic-Related Air Pollution Across Different Microenvironments," *J. Transp. Heal.*, 3(2), S72.

Wangle, A. M. (2009). Perceptions of traits of women in construction. Retrieved April 5, 2014, from [http://etd.fcla.edu/UF/UFE0024445/wangle\\_a.pdf](http://etd.fcla.edu/UF/UFE0024445/wangle_a.pdf)

Wong, S. C. K., & Liu, G. J. (2010). Will parental influences affect career choice?: Evidence from hospitality and tourism management students in China. *International Journal of Contemporary Hospitality Management*, 22(1), 82-102.