Exploring Gender and Ethnic Diversity Recruitment Goals: Comparing 2007-2017 CM Education and Industry Trends

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The US construction industry is projected to face a shortage of skilled construction managers and front-line supervisors. One means of mediating the labor shortage is to increase the enrollment of underrepresented groups in undergraduate construction management (CM) education. This study investigated the 2007-2017 enrollment trends of CM undergraduate students at a large public university as compared to CM workforce trends reported by the United States Bureau of Labor Statistics (BLS). Findings suggest that the enrollment levels of diverse undergraduate CM students are similar to the participation rates of the same groups within the CM industry. These trends indicate that traditionally underrepresented populations in the CM labor force (i.e., females and minorities) represent a substantial gap and, therefore, a recruitment opportunity for the CM program of interest. This paper provides a model for collecting and displaying diversity data and enrollment baselines for CM programs. Limitations and opportunities for future research are discussed.

Key Words: Diversity, Gender, Ethnicity, Enrollment, Recruitment, Retention, CM Students, Construction Managers, Front-Line Supervisors

Introduction

Research indicates that the construction industry will face a shortage of skilled workers and project managers given the anticipated employment demands (National Center for Construction Education and Research (NCCER), 2013; United States Bureau of Labor Statistics (BLS), 2018b). While construction represents one of the largest contributors to the United States Gross Domestic Product, construction has not had a highly diverse workforce, especially in management and executive roles (Chun et al., 2009). Underrepresented groups, particularly women, minorities, and veterans, represent the greatest opportunities for recruiting new workers in construction management (CM) roles (NCCER, 2018). According to the United States BLS (2018b), individuals "with a bachelor's degree in construction science, construction management, or civil engineering, coupled with construction experience, will have the best [construction management] job prospects". However, low enrollment in construction-related education programs by women (generally under 10%) and minorities (under 20%) indicate that many potential construction industry workers pursue degrees and careers in areas other than CM after high school (Escamilla et. al, 2018; Oo, Li, and Zhang, 2018; Raiola and Kovel, 2014). In light of these statistics, it is important the CM programs investigate there student enrollment and recruitment trends from a diversity perspective in order to supply the construction industry with an adequate number of qualified construction management personnel.

Women represent 46.9% of employed persons in the US and have higher post-secondary outcomes than their male counterparts but are underrepresented in STEM fields (Beede et. al, 2011; Ryan & Bauman, 2016; US Census, 2018). Research indicates low participation rates among women in CM can be attributed to: 1) poor industry image; 2) deficiency of career knowledge; 3) gender stereotyping; 4) abrasive work culture; 5) engineering emphasis in CM education; and 6) diminishing self-confidence (Bigelow, Bilbo, Mathew, Ritter, & Elliott, 2015). For the relatively few women within the CM industry, gender bias can still create barriers. According to Chun et al (2009), "Female construction managers perceive bias against them in the form of skepticism and indifference as a response to their gender." While workforce participation among females in construction has remained relatively static for several decades, other traditionally male-dominated industries have seen increases. In the 1980s, only 5.8% of the engineers in the U.S. were women, but by 2012, that number had increased to 14% (Crawford, 2012).

According to the United States Census Bureau (2017), the US population (not including those selecting multiple ethnicities) was 60.7% White, 18.1% Hispanic/Latino, 13.4% Black/African American, and 5.8% Asian. The racial/ethnic structure of the US workforce is expected to experience a rapid shift in future decades. It is projected that people of color in the US will increase from 37.8% of the population in 2014 to 56.7% by 2060 (Colby &

Ortman, 2015). Recent decades have witnessed an abrupt demographic shift in the construction labor force, particularly in the wake of the "Great Recession", with Latinos/Hispanics providing an influx of human capital to an aging and shrinking workforce. Between 2012 and 2015, Latinos/Hispanics accounted for 69% of new construction hires (Wang, Dong, & Vikraman, 2016) and the percentage of Hispanic owned construction firms more than tripled between 1992 and 2012 (Wang et al., 2016). However, until recently, academic research concerning minorities in CM and the construction labor force has been virtually absent; with the exception of safety disparities among Hispanics/Latinos.

According to a report by McKinsey Co. (Hunt, Layton, & Prince, 2015), companies with more diverse employees may be more profitable than ethnically homogenous companies. In fact, a recent study found that companies in the uppermost quartile of gender diversity within their executive boards were 21% more likely to have above average profitability than those in the lowermost quartile. In the same study, companies in the uppermost quartile for ethnic and cultural diversity within their executive boards were 33% more likely to have above average profitability (Hunt, Layton, & Prince, 2015). In order to access, management positions in construction, a bachelor's degree is highly important (BLS, 2018a). The ability to recruit and retain women and minorities in construction education and ultimately into the construction industry will be imperative to meeting the demand for within a growing industry. The responsibility for initiating and sustaining this change falls on both education programs and on employers in the construction industry.

Purpose of the Study

In light of the literature and statistics presented above, this study investigated the 2007-2017 enrollment levels of women and minorities in CM education at a large, public university in the mountain region of the United States. Further, the researchers compared 10-year trends in collegiate CM enrollments by gender and ethnicity with the 10-year participation rates of the same groups in construction management roles in industry as defined by the United States BLS (e.g., 'Construction Managers' and 'Front-Line Supervisors'). Comparative analysis of descriptive and percentage data were utilized to determine trends and gaps between groups.. The results herein provide a parallel comparison of CM program diversity to industry diversity. The purpose of this paper was to provide a model for collecting, comparing, and disseminating data regarding student diversity and nationally applicable baselines for enrollment in CM programs. This method and data can be helpful in informing academia regarding the design and timing of recruitment and retention programs for groups that are traditionally underrepresented in CM.

Method

CM student data were retrieved from reports generated by the Institutional Research (IR) department of a land grant university in the Mountain Region of the United States. The target population of this study was undergraduate students majoring in CM. Data and reports on the IR website were publicly accessible and presented in an aggregated format with no unique student identifiers. In this study, data were delimited to the last 10 years (2007-2017) to investigate the study population and explore recent trends in gender and ethnic diversity among CM students at the institution of study.

Construction industry data were obtained from reports generated by the United States BLS. BLS data and reports were publicly accessible and are presented here in an aggregated format with no unique individual identifiers. As with the student data, industry employment data were delimited to the last 10 years (2007-2017) for comparison to the target population; CM students at the institution of study.

Treatment of the Data

The CM student data utilized in this study were retrieved from the University's IR College Enrollment by Demographics report. Reported percentages were delimited to include only undergraduate students enrolled in the CM department during the fall semesters of 2007-2017. The CM department of focus in this study is a restricted program where admissions criteria must be met prior to formal acceptance as a CM major. It should be noted that the data included in this study contained both students who have been accepted into the CM program as well as those students who were working toward meeting the CM program admission criteria at the time of the survey.

The construction industry data utilized in this study were retrieved from the 2007-2017 BLS household survey. The BLS household survey is voluntary, distributed nationally and data are self-reported by participants (United States

Census Bureau, 2018). The census surveys do not include any questions requiring participants to report their citizenship status. The BLS completed the grouping and presentation of the data by gender and ethnicity (BLS, 2018a). Categorical groupings of Gender (e.g., "sex" in BLS reports) and Ethnicity (e.g., "Black/African American", "Asian" and "Hispanic/Latino") were derived directly from the BLS database. Descriptive and percentage data by grouping category were exported from the BLS database and used verbatim in the tables and comparisons presented herein.

Comparative Analysis

This study compared the gender and ethnic-diversity of CM students with CM professionals through investigation of the percentage of students and employees who self-reported these demographic characteristics. While the BLS reports present demographic data for numerous construction trade positions (carpenters, pipefitters, etc.), the BLS employment categories of 'Construction Manager' and 'Front-Line Construction Supervisor' were identified from the household survey as the most similar positions to those obtained by students upon graduation from the CM program of interest. Percentages for each employment type, aggregated by each demographic grouping were obtained directly from the BLS database. Comparison was completed in tabular format for each year (2007-2017) and for the 10-year average.

Results

The following section provides the aggregated and ten-year trends for gender and ethnic diversity among CM students and Construction Industry Supervisors. Specifically, tables and figures depict the gender and ethnic diversity in the CM program of interest for comparison to the national frequency of those who reported employment as Construction Managers or Front-Line Supervisors at the time of the BLS census for each year, respectively. It should be noted that the sample size for these groups (BLS n = 711,000 to 1,176,000; CM student n = 492 to 1034) are exclusive to the specified year. That is, a person completing the census who reports "construction manager" from 2007 to 2011 as well as CM students enrolled from 2007-2011 were counted in each respective year.

CM Professionals by Gender and Ethnicity

Table 1 provides the yearly percentage of industry construction managers who identify as women, and those who report an ethnicity of 'Black/African American', 'Asian' or 'Hispanic/Latino', respectively. For those employed as construction managers, the 10-year industry averages were 6.9% female, 3.5% Black/African American, 2.1% Asian and 10.0% Hispanic/Latino. Figure 1 provides a graphic depiction of the 10-year industry trends for each group. Holistically, small increases in the Black/African American and Hispanic/Latino proportion of CMs were observed, while women (6.1-8.1%) and Asian (1.5-2.5%) representation among CMs remained nearly static with overall fluctuations between 1% and 2% during the 10-year study window.

Table 1. 2007-2017 CM Professionals by Gender and Ethnicity Category

Construction managers	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Reported *n* in 1000's	956	1176	1083	1099	1083	926	983	821	711	737	812	1081
Women (%)	6.9	8.1	6.8	5.9	6.8	6.1	6.4	7.3	7.4	6.7	7.4	7.4
Black or African American (%)	3.5	2.6	3.5	3.3	3.5	3.0	3.7	3.1	3.7	3.3	3.8	4.9
Asian (%)	2.1	1.5	2.0	1.7	2.0	1.5	2.2	2.5	2.3	3.2	2.0	2.3
Hispanic or Latino (%)	10.0	9.2	8.5	8.2	8.5	9.7	9.4	10.1	10.2	12.9	11.0	12.4

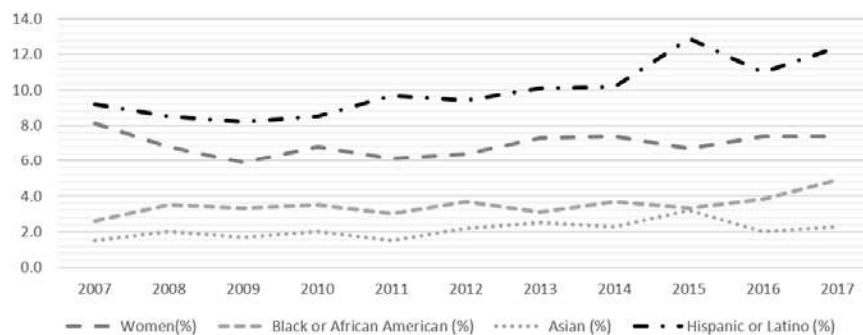*Reference: United States Bureau of Labor Statistics Household Data (2007-2017)*

Figure 1. 2007-2017 CM Professionals by Gender and BLS Ethnicity Category

Front-Line Construction Supervisors by Gender and Ethnicity

Table 2 provides the yearly percentage of construction front-line supervisors who identify as women, as well as those who report an ethnicity of 'Black/African American', 'Asian' or 'Hispanic/Latino', respectively. The 10-year averages were 3.0% women, 5.0% Black/African American, 1.1% Asian and 17.6% Hispanic/Latino. Figure 2 provides a graphic depiction of the 10-year trends for each group. A nearly 10% increase in the Hispanic/Latino proportion of front-line supervisors was observed between 2012 and 2017. A small increase in Black/African American participation as front-line supervisors was noted. However, similarly to CMs, women and Asian representation among front-line supervisors remained minimal and nearly static at (2.1-3.9%) and (0.7-1.5%), respectively, across the 10-year timeframe.

Table 2. 2007-2017 Construction Front-Line Supervisors by Gender and BLS Ethnicity Category

Front-Line Supervisors	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Reported *n* in 1000's	694	918	695	735	659	634	634	631	696	712	680	639
Women (%)	3.0	3.2	3.6	3.7	3.9	2.2	2.8	2.1	2.4	3.3	2.6	3.0
Black or African American (%)	5.0	3.8	4.9	5.0	4.9	5.2	4.5	3.5	5.7	6.2	5.5	5.4
Asian (%)	1.1	0.7	1.0	0.8	1.0	0.7	1.3	1.2	1.1	1.2	1.5	1.2
Hispanic or Latino (%)	17.6	15.9	16.5	16.1	16.5	16.5	14	15.7	18.9	16.7	22.5	24.5

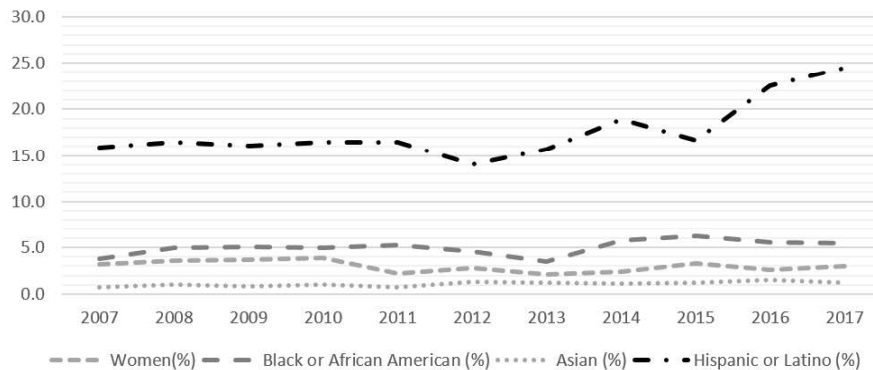*Reference: United States Bureau of Labor Statistics Household Data (2007-2017)*

Figure 2. 2007-2017 Construction Front-Line Supervisors by Gender and BLS Ethnicity Category

CM Students vs. CM professionals

Table 3 provides the yearly percentage of CMs, front-line supervisors, and CM students who identify as women. The 10-year averages were 6.9% female for CMs, 3.0% female for construction front-line supervisors, and 7.1% female for CM students. Figure 3 provides a graphic depiction of the 10-year trends for female representation each group. The percentage of female CMs, front-line supervisors and CM student remained minimal and nearly static at (5.9-8.19%), (2.1-3.9%), and (5.9-9.3%) respectively, across the 10-year timeframe.

Table 3. 2007-2017 CM Students vs. CM professionals by Gender

CM professionals	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Female CMs (%)	6.9	8.1	6.8	5.9	6.8	6.1	6.4	7.3	7.4	6.7	7.4	7.4
USBLS Female F-L Supervisors (%)	3.0	3.2	3.6	3.7	3.9	2.2	2.8	2.1	2.4	3.3	2.6	3.0
Female CM Students (%)	7.1	6.8	6.6	6.5	6.3	5.9	9.3	8.7	7.2	6.4	6.5	7.5

Reference: United States Bureau of Labor Statistics Household Data (2007-2017)

Figure 3. 2007-2017 CM Students and CM professionals by Gender

Table 4 provides the yearly percentage of CMs, front-line supervisors, and CM students who identified as Hispanic/Latino. The 10-year averages for Hispanic/Latino individuals were 10.0% for CMs, 17.6% for construction front-line supervisors, and 8.4% for CM students. Figure 4 provides a graphic depiction of the 10-year trends for Hispanic/Latino representation by each group. The percentage of Hispanic/Latino CMs, front-line supervisors and

CM students remained nearly static between 2007 and 2011. However, increases in Hispanic/Latino CMs, front-line supervisors, and CM students observed between 2012-2017; 3%, 10.5%, and 7.2%, respectively.

Table 4. 2007-2017 Percentage of Hispanic/Latino CM Students vs. CM Professionals

CM professionals	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Hispanic/Latino CMs (%)	10.0	9.2	8.5	8.2	8.5	9.7	9.4	10.1	10.2	12.9	11.0	12.4
USBLS Hispanic/Latino Supervisors (%)	17.6	15.9	16.5	16.1	16.5	16.5	14.0	15.7	18.9	16.7	22.5	24.5
Hispanic/Latino CM (%)	8.4	4.9	5.2	6.4	6.3	6.1	6.9	9.1	9.5	12.2	12.3	14.1

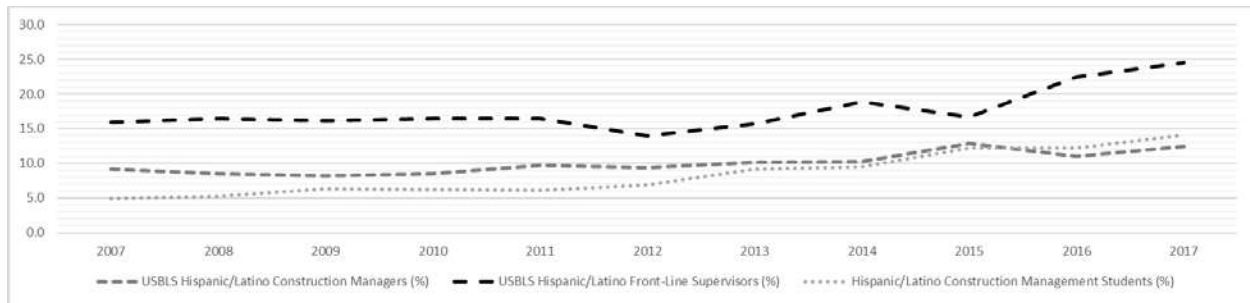*Reference: United States Bureau of Labor Statistics Household Data (2007-2017)*

Figure 4. 2007-2017 Percentage of Hispanic/Latino CM Students vs. CM Professionals

Table 5 provides the yearly percentage of CMs, front-line supervisors, and CM students who identified as Black/African American. The 10-year averages for Black/African American individuals were 3.5% for CMs, 5.0% for construction front-line supervisors, and 1.3% for CM students. Figure 5 provides a graphic depiction of the 10-year trends for Black/African American representation by each group. The percentage of Black/African American CMs, front-line supervisors and CM students were low and remained nearly static with maximum yearly fluctuations of less than 1.5% from the 10-year mean. The proportion of Black/African American CM students was low, with a 10-year range of 0.3% in 2007 to a peak of 2.0% in 2013; this was followed by a decline to 1.3% in 2017.

Table 5. 2007-2017 Black/African American CM Students vs. CM professionals

CM professionals	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Black/African American CMs(%)	3.5	2.6	3.5	3.3	3.5	3.0	3.7	3.1	3.7	3.3	3.8	4.9
USBLS Black/African American F-L Supervisors (%)	5.0	3.8	4.9	5.0	4.9	5.2	4.5	3.5	5.7	6.2	5.5	5.4
Black/African American CM Students (%)	1.3	0.3	0.5	0.8	1.2	1.4	1.8	2.0	1.8	1.8	1.3	1.3

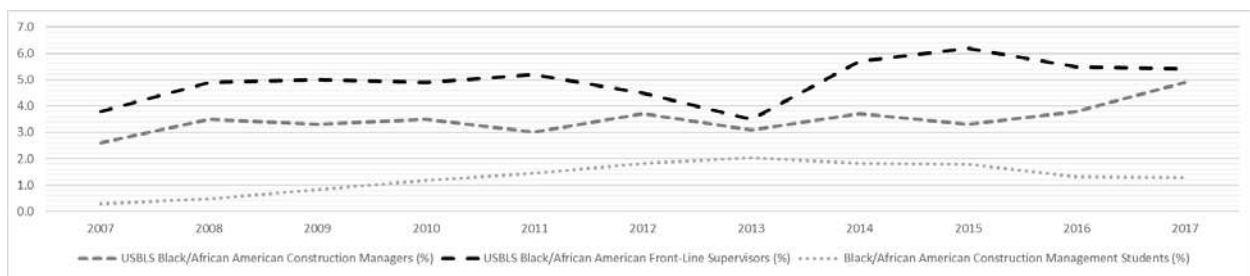*Reference: United States Bureau of Labor Statistics Household Data (2007-2017)*

Figure 5. 2007-2017 Black/African American CM Students vs. CM professionals

Table 6 provides the yearly percentage of CMs, front-line supervisors, and CM students who identified as Asian. The 10-year averages for Asian individuals were 2.1% for CMs, 1.1% for construction front-line supervisors, and 0.9% for CM students. Figure 6 provides a graphic depiction of the 10-year trends for Asian representation by each group. The percentage of Asian CMs were low and remained nearly static with maximum yearly fluctuations of 1.2% from the 10-year mean. The percentage of Asian front-line supervisors and CM students were low and remained nearly static with maximum yearly fluctuations of less than 0.5% from the 10-year mean.

Table 6. 2007-2017 Asian CM Students vs. CM professionals by Gender

CM professionals	10-Year Average	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
USBLS Asian CMs (%)	2.1	1.5	2.0	1.7	2.0	1.5	2.2	2.5	2.3	3.2	2.0	2.3
USBLS Asian F-L Supervisors (%)	1.1	0.7	1.0	0.8	1.0	0.7	1.3	1.2	1.1	1.2	1.5	1.2
Asian CM Students (%)	0.9	1.1	0.9	1.3	0.8	0.8	0.6	1.0	1.0	0.8	0.9	0.6

Reference: United States Bureau of Labor Statistics Household Data (2007-2017)
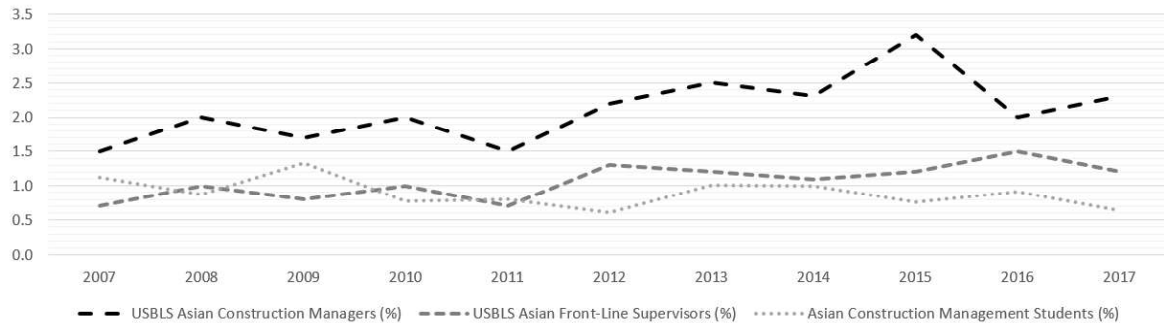
Figure 6. 2007-2017 Asian CM Students vs. CM professionals

Discussion

When compared to the US workforce at large, results indicate that females, Black/African Americans, Asians and Hispanics/Latinos (with the exception of Hispanic/Latino front-line supervisors) are underrepresented among CM professionals and in CM education. Comparison of current employment rates among industry CMs revealed that female and Hispanic/Latino enrollment was tracking relatively closely with industry averages. However, it was also noted that substantial disparities exist in construction employment demographics given gender and ethnicity.

The shortage of qualified females and minorities in leadership roles will not change if academic enrollment continues to mirror industry trends. Therefore, setting goals for CM programs to have a higher proportion of women and ethnic minorities may be a reasonable starting point for academia to increase the pipeline of candidates pursuing careers in CM. To address the workforce shortage CM programs should commit to improving the recruitment and retention of underrepresented groups. This study represents the critical initial step of quantifying the enrollment gaps within the program of study.

The current proportions of traditionally underserved student groups can be found through many college or universities' Institutional Research (or similar) office. For land-grant universities and other public institutions that are tasked with primarily serving in-state students, it could be beneficial to compare student demographics to state or regional population demographic data from the U.S. census or other sources to determine how closely the current department demographics reflect the local population. This information is paramount in creating and fine-tuning realist recruitment goals. At an institutional level, CM departments could identify departments or majors that are, or have been, traditionally male-dominated or racially homogenous to identify successful (and unsuccessful) practices and initiatives aimed at supporting and increasing the percentage of female and minority students.

For researchers interested in understanding and increasing diversity within CM education and industry, it may be useful to broaden the spectrum of theoretical frameworks and research designs traditionally utilized within CM research. For example, the utilization of educational and social theories in conjunction with first-person interviews with female and minority students could further illuminate the understanding of how the current systems and culture of CM education and industry adversely affect these groups. For non-researchers, a similar exploration could be as simple as speaking with underrepresented students about their experiences within the CM major or industry and being open exploring concerns related to race/ethnicity and gender discrimination.

Conclusion

The past decade of data suggests that the proportion of women and minorities in CM is unlikely to increase without targeted efforts and initiatives. Therefore, intentional recruitment strategies and dedicated faculty and staff who are able to implement initiatives will be critical for increasing the proportion of women and minorities in CM programs

and the workforce. Recruitment efforts to increase the proportion of underrepresented student groups should focus on working with populations that include a strong proportion of those students such as ethnically diverse high schools or programs for females interested in STEM careers. Research-supported, exemplary recruitment activities include, but are not limited to, hosting individual visit days, providing summer bridge programs, offering open houses at the CM program for interested students and families as well as collaborations with local middle and high schools to offer construction-related team activities and discuss CM as a career path (Baker & Slunt, 2017; Tsui, 2007). This study provides an important step toward remediating CM workforce shortages through the inclusion of large, currently underrepresented, groups of qualified individuals.

Limitations and Future Research

Several data characteristics should be considered when interpreting the study results. For example, data were self-reported by participants in both the IR and BLS datasets. Therefore, accurate and correct responses are assumed. With specific regard to the BLS data, while no specific questions about US citizenship were asked, it is possible that undocumented workers may choose not to complete the survey. Further, it should be noted that latent variables may exist that affect the interpretation of university enrollments and construction industry employment between 2007-2017; these include but are not limited to "the great recession" as well as employee departures from construction based on increased gas and oil production in the region of focus, etc. Given these considerations, this paper provides several potential areas of future research. Future studies should investigate statistically-driven trend analysis of enrollment and industry participation rates as well as , but not limited to, the investigation of regional, state and local population demographics in light of targeted recruitment efforts in CM education and a study of the effectiveness of efforts to retain female and ethnically diverse students once enrolled in a CM program.

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