



## Examination of Future Construction Career Role Preferences and Identities of Construction Students

### Mr. Dorail F. Porter, Associated General Contractors

Undergraduate Construction Management student attending North Carolina Agricultural and Technical State University. Executive Board member on the NCAT chapter of Associated General Contractors of America . Undergraduate Research Assistant in the Built Environmental Program

### Dr. Andrea Nana Ofori-Boadu, North Carolina A&T State University

Dr. Andrea Ofori-Boadu is an Assistant Professor with the Department of Built Environment at North Carolina Agricultural and Technical State University. Dr. Ofori-Boadu has over twenty years of relevant occupational experience in construction technology/management (industry), teaching, research and service. Dr. Ofori-Boadu has served in various capacities on research and service projects, including Principal Investigator for two most recent grants from the Engineering Information Foundation (EIF) and the National Association of Home Builders (NAHB). In 2017, Dr. Ofori-Boadu received both the College of Science and Technology (CoST) Rookie Research Excellence Award and the North Carolina A & T State University (NCAT) Rookie Research Excellence Award. She also received the Teaching Excellence Award for the Department of Built Environment. Under her mentorship, Dr. Ofori-Boadu's students have presented 10 research posters at various NCAT Undergraduate Research Symposia resulting in her receiving a 2017 Certificate of Recognition for Undergraduate Research Mentoring. She was also selected as a 2018 National Science Foundation - NC A & T ADVANCE IT Faculty Scholar. Her primary research engagements have been in bio-modified cement pastes, sustainable construction, and STEM education. She has received over \$170,000 to support her teaching, research, and outreach projects. Overall, Dr. Ofori-Boadu's research work has resulted in 1 book publication, 13 publications in peer-reviewed journals, 5 conference proceedings, 2 accepted manuscripts (in-press), 3 manuscripts under review, 29 presentations at national conferences, and 27 poster sessions. In 2016, her publication was recognized by the Built Environment Project and Asset Management Journal as the 2016 Highly Commended Paper. In 2015, Dr. Ofori-Boadu established her STEM ACTIVATED! program for middle-school girls in Guilford county. She has also worked with the STEM of the Triad home-schooled children at Winston-Salem, North Carolina. In 2017, Dr. Ofori-Boadu established the REAL Professional Development Network for developing the leadership, networking, and other soft skills of undergraduate students at NCAT. Dr. Andrea Ofori-Boadu also serves as the Executive Vice-President of Penuel Consult, Incorporated. Dr. Ofori-Boadu is married to Victor Ofori-Boadu and they have been blessed with three wonderful children.

## **EXAMINATION OF FUTURE CONSTRUCTION CAREER ROLE PREFERENCES AND IDENTITIES OF CONSTRUCTION STUDENTS.**

### **Abstract**

Considering that the construction industry is a broad field with many different roles and responsibilities, the purpose of this research study was to examine construction students' rationale for their future construction career role preferences so that construction educators can better prepare them for these roles. This study draws from previous research work and theories associated with self-interests and career identities. Engaging construction students in well-designed academic work that contributes to their preferred career roles in construction industry could increase their motivation to excel, their career identity formation, their academic success, and their smooth transitions into their preferred career roles upon graduation. The main reason for these positive outcomes would be because their academic work would line up better with their self-interests. It is therefore very important that construction educators align their curricula content so that it better prepares students for their preferred career roles. The first step in this process would be to gain insights into the preferred roles of current students. Consequently, the objectives of this research were to identify students' career role preferences and the factors influencing their preferences; examine students' reasons for pursuing construction education; and discuss students' recommendations for construction education program improvements to better prepare them for their future roles in the construction industry.

A self-reporting survey was administered to 42 students enrolled in the construction program at an HBCU. With a 1-10 rating structure, students indicated their preference for each role by assigning a number (rating) to that role. The Mean Preferred Career Role Score (MPCRS) for each listed role was calculated to determine students' most preferred career roles. With the open-ended survey items, students had the opportunity to discuss the underlying reasons for their career role preferences and recommend construction education program improvements. Informal discussions with some selected students provided additional insights.

Key findings indicated that future construction career role preferences were: (a) Project Manager (MPCRS = 8); (b) Superintendent (MPCRS = 7); (c) Real Estate Developer and Graduate Student (MPCRS = 6); and (d) Estimator / Inspector (MPCRS = 5). The reasons construction students gave for preferring the project manager and superintendent roles included high salaries, opportunity to lead, love for authority, prior experiences, internships, role models, management skills, hands on work, and working outdoors. The study showed that key reasons for students' pursuit of a CM degree included hands-on work, prior experience in the construction field, and a genuine interest or love for construction. Through surveys and informal discussions, students agreed that to better prepare them for their preferred roles, undergraduate construction programs should endeavor to allocate more resources to enhancing the following: course availability and variety; challenging projects; hands-on activities, innovative teaching methods, well-designed mentoring programs, collaboration with industry partners, internships, field trips, workshops, residential construction knowledge and experiences, and extracurricular activities. Findings from this study provide insights that may be used to guide curriculum development, student advisement, and better preparation of construction students so that they can excel in their preferred roles in the construction industry.

## Introduction

Construction students look forward to graduation with aspirations of full-time employment that will allow them to be responsible citizens and contributors to the construction industry. Considering that the construction industry is a broad and dynamic field with many different roles and responsibilities, students who graduate from construction programs have a wide range of opportunities and gain employment in various sectors of the construction industry [1]. Roles for potential employment available for construction undergraduate students include project engineers, project managers, program managers, quantity surveyor, estimators, building inspectors, suppliers, subcontractors, contractors, construction developers, real estate developers, researchers, and educators [2][3]. However, most construction curricula are highly tailored to prepare students for project management and estimating roles. Generally, project managers plan, budget, oversee, and document all aspects of their construction projects, while estimators determine the quantities and costs of construction projects. Furthermore, many construction programs are structured to prepare students mostly for commercial construction projects [1]. This is logical as most of the employers of undergraduate Construction students offer student opportunities to work on commercial construction projects. With the current focus of construction educational programs on the two typical construction roles (project manager and estimator), many construction programs place significant emphasis on blueprint reading, construction materials, construction equipment, estimating, scheduling, and project management for commercial construction projects, and to a limited extent on residential, industrial, and infrastructure projects. Therefore, the current construction curriculum content and structure is mostly beneficial to students whose aspirations and preferred career paths are towards project management and estimating roles for commercial buildings. These students gain the knowledge, skills, experience, and career identities needed to excel in these roles. Nevertheless, there remains a section of construction students who are interested in gaining employment in other roles in the construction industry, and in other non-commercial building sub-sectors such as the heavy and civil engineering sub-sector.

Consequently, with the intense focus of construction programs on project management and estimating roles, construction graduates who desire to gain employment in other roles in the construction industry or to work with non-commercial construction sectors are limited. These students graduate without the knowledge, abilities, confidence, and career identities to smoothly transition into their preferred roles, as those roles were not adequately addressed in current construction programs. Furthermore, because these other roles or construction sectors are not the focus of most construction programs and are not discussed to a satisfactory extent in construction classrooms and laboratories, some students do not even have the chance to seriously consider those roles and even decide if they would prefer to work in those roles in the future. Unfamiliarity and misconceptions about professional roles brings conflicts during practice and also increases students' doubts about their level of knowledge and capabilities [4]. Construction graduates have found themselves working on transportation and infrastructure projects, instead of the typical commercial construction building projects that they are mostly prepared for through typical construction programs. It is not uncommon to find students who have graduated and later found out that with adequate construction education preparation they could have been a better fit for yet other roles in the construction industry, other than the prevalent project manager and estimator role. Some fully employed graduates have expressed their struggles when they initially entered the

construction workforce. While many express that they wished that they had paid more attention in their construction classes, many of them also think that construction education programs could have better prepared them for their current roles, which were not in project management nor in estimating.

It is important that though less than the majority, there are construction students who are seriously interested in gaining the knowledge, skills, and experience to perform in equally important construction industry roles, other than the project manager and estimator roles. After graduation, it is difficult for these students to demonstrate confidence and strong career identities at their new jobs in their preferred roles because their exposure to the required knowledge, experiences, and role-models are limited. Career identities are particularly important as students who graduate with low career identities are less likely to persist and be successful in their preferred career roles. Consequently, there is the need for construction programs to be structured in a manner that will allow construction graduates to successfully function in other roles that are not necessarily project management or estimating roles. Without guidance, students cannot successfully transition into their preferred career paths in the construction industry, and this becomes a hindrance to their motivation to learn, their academic success, the formation of their career identities and their overall success in the construction industry [5].

One the primary purposes of construction engineering or management curricula is to help students transition quickly to professionals in as little as four or five years, by increasing students' ability to translate classroom theories and principles to working effectively with a variety of professionals playing different roles and in multiple disciplines in the construction industry [5]. However, there exists a gap between undergraduate construction curricula and the preparation required for construction students to strongly identify and excel in their preferred career roles in the construction industry. Consequently, this gap has to be bridged by revising construction program content and structure to enhance students' academic preparation and the capacity to excel in these roles. In order to excel in their preferred potential roles, construction curricula should be designed to provide students with knowledge, skills, experiences, and opportunities to meet students' career role interests and enhance the effective formation of their role identities. Students with high career identities are more likely to perform successfully in their future roles in the construction industry [6].

## Literature Review

This research study draws from literature that advocates that students' self-interests impact their career interests; and educational preparation that aligns reasonably with students' career interests will increase students' motivation for high academic achievement, enhance their career identity formation, and increase career readiness and success. Career role or professional identity describes how a person sees himself or herself as the type of person that can perform in a specific career role and how they feel like that particular role is for them [7]. Professional identity is also associated with status, esteem, mastery, sense of belonging, and attachment; while self-interest refers to the opportunities that an individual believes can be acquired through specific educational or career actions [8]. Students' background, character, exposure, and personal interests affect their self-interests and the career decisions. Both professional identity and self-interest are linked with career choices, motivation, and success [8]. Engineering identity has been shown to predict education

and professional persistence, with research work focusing on the extent to which students can identify, consider, or see themselves as engineers [7]. Academic preparation influences career role identities within the construction and engineering industry which offers multiple opportunities that allow employees to be matched with the career role that best matches their backgrounds, characters, interests, academic preparation, and career role identities [8]. Role identities have been measured by students' perceptions about their ability to perform well, understand concepts, be interested in subjects, and feelings of recognition that they are seen as a good student by peers, family, teachers, as being the type of person that can be successful in that role [7]. The early formation of career identities could enhance educational and professional persistence [6]. In particular, a students' sense of belonging to a professional community is critical to their success along that career pathway [9]. Several factors and experiences influence students' choice to stay in a particular profession, and the practice and culture of the profession, as well as the engineering and educational opportunities can foster or hinder belongingness and identity development [7]. Consistently, education researchers are investigating questions associated with students' self-identification as professionals in their field of study. Factors such as gender, career goals, career exposure, and academic success are predictors of this self-identification [9]. Vocational interests, occupational self-efficacy, occupational prestige are closely associated with each other, and with school, leisure, and actual engagement in corresponding activities [10]. Career identity has been linked with career development [6]. The lack of adequate training, time, and incentives could create tension with truly recognizing and forming professional identity. It is important that students are trained in an educational atmosphere that defines and strengthens their career identities [11].

In order to improve career identities and success, construction curriculum should include well-designed senior projects [4]; service learning [12]; industry partnerships and professional development workshops [13]; electives [14]; project-based learning [5]; internships [15]; and train students to use updated technology [16]. Educators should not be afraid to modify existing courses or even introduce new courses to reflect changing needs of societies [14]. Due to their backgrounds, some students are aware of the changing needs in the construction industry, and enter into construction programs expecting to be prepared to meet the most current needs of the construction industry. Many students enter the program desiring for knowledge and experiences that can help them excel in their preferred career roles. There is a need for the construction curriculums to constantly strive to provide students with the education that will enhance their career role identities and success in their preferred roles upon graduation. There is the need for construction programs to bridge the gap between these expectations and their curriculum content [1]. Well-planned modifications will ensure that students are provided the opportunities to prepare for their preferred career roles as their career interests enhance their career identities and academic success [7]. Students will be motivated to work harder and be successful in construction education programs that are well-aligned with students' preferred construction career roles.

#### Purpose of research study

Before any construction curriculum or program can be strategically modified to address the previously discussed deficiencies and better prepare undergraduate students for their preferred future construction management roles, it is important for educators to first know the preferred roles of current construction students. To the best knowledge of the researchers, no paper was found to have provided this much needed information. To this end, the purpose of this research was to

identify students' future construction career role preferences and the rationale for their preferences. Furthermore, factors affecting students' pursuit of construction education, factors guiding their decisions to pursue their preferred construction roles, and the construction program improvements necessary for students to excel in their diverse preferred roles are discussed.

## Methodology

A self-reporting survey was administered to 42 undergraduate construction students enrolled in an accredited construction program at a university located in the southeastern region of the United States. The survey was split into two sections. Section 1 was used to collect background information for participant description purposes. In section 2, students had to indicate their preferred construction career roles and explain the reasons for their preferences. In this section, there was a list of 10 common roles within the construction industry that students who graduated from a Construction Management program could be gainfully employed. While nine of the listed roles were pre-determined and listed on the surveys, students were given the opportunity to list their preferred role, if it was not included in the original list. With a 1-10 rating scale, students were required to indicate their preference for each listed role by assigning a rating that reflected the level of their preference for that role. The Mean Preferred Career Role Score (MPCRS) was calculated by determining the overall mean score that students assigned to each role. Data obtained were analyzed using descriptive statistics and reported using tables and figures. The open-ended survey items allowed students to discuss the underlying reasons for their career role preferences and recommend construction education program improvements. Informal discussion with selected students provided additional insights.

## Results

### Description of participant population

In agreement with publications that confirm female underrepresentation in STEM disciplines, figure 1 shows that the female population in this study was 17% and the male population was 83%. Construction classrooms and industry continue to be male-dominated, and this has been recognized as a trend in the construction industry for years. As of 2016, women only make up 9.1% of the construction industry; while, in other industries such as sales and office, women make up 45% which more than quadruples their population in the construction industry [17].

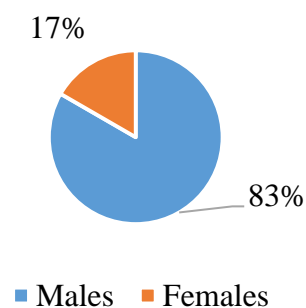


Figure 1. Gender

Figure 2 to shows that most of the participants in this study were freshmen and seniors. They were closely followed by sophomores and juniors. This good proportion allows the preferences and views of all the four major classifications to be included in the research study.



Figure 2. Participant Classification

Figure 3 showed that majority (79%) of the participants had grade point averages that were higher than 2.5 on a 4.0 scale. This suggested that students are retaining material they are being taught in class in class. Also, it indicated that they maintained an interest in the construction program and were satisfactorily were committed to academic success.

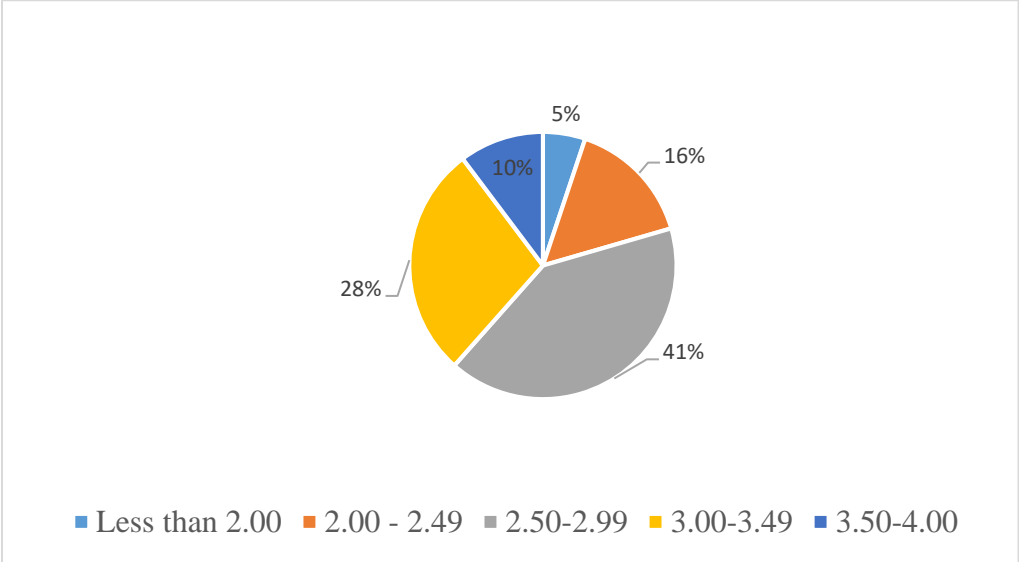


Figure 3. GPA

Figure 4 shows that 63% of the participants had gained some form of construction experience including internships and full-time positions. Upon additional investigation, it was found that all the participants who had selected 'Other' on the survey were referring to part-time construction employment, mostly related to family business. Students in these categories enter the construction program with a specific preferred role that matches with their family business. In future self-reported surveys, researchers will include an option for students engaged in part-time construction work. Notably though, most of the students who indicated no experience in the construction industry were freshmen. Considering that the construction education program places emphasis on gaining construction experiences, the number of students with no construction experience decreases with classification. Gaining construction experience is very important for undergraduate students to gain understanding of the future career roles and improve their career identity formation. Furthermore, such opportunities allow undergraduate students to make more informed decisions regarding their future career roles in the construction industry.

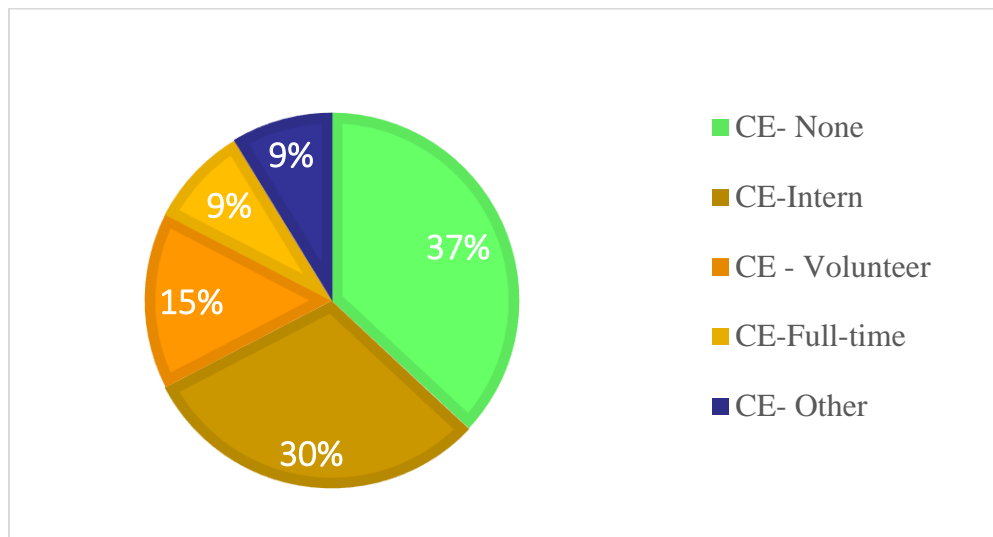


Figure 4. Construction Experience

Twenty-three percent of the participants were engaged in some form of leadership with a construction-related student organization. Fifty-one percent of the participants were members of student organizations at the university. These descriptive statistics demonstrate that construction students actively participate in extracurricular activities that enhance their sense of belonging to the construction industry, and this in turn, contributes to the formation of their career identities. Notably, though, these organizations were mostly related to the contractor and construction manager role, and therefore presented significant opportunities for students' development in these construction career roles.

Results indicated that students had got to know about the construction program through online research, referrals from engineering department advisors, referrals from community college faculty members, university orientation events, recruitment by construction faculty members, or



referrals from fellow students and alumni of the university. Frequent reasons that students gave for pursuing a construction degree included high salaries, hands on work, desire to learn about construction engineering, satisfaction from seeing construction project progress to completion, strong mathematics and science background, love for research, construction courses from high school, prior experience in the construction field, genuine interest or love for construction, timely graduation, and recommendations from role models and other friends. These self-interests drive students to enroll in the construction program and to continue to progress to completion.

Figure 5 showed that with the project manager roles (MPCRS = 8) was the most preferred role. This was expected considering that construction programs focus on preparing students for project management roles and as such a significant number of the students enroll into the program with the expectation that they would be prepared to function in project management roles. Also, the construction curriculum focuses on project management, and so even students who preferred other roles prior to enrolling in the program, sometimes, change their mind and begin to seriously consider the project management role as their preferred role. Considering that many of the representatives of recruiting construction companies, industry collaborators, and guest speakers, are project managers, students identify better with the role of the project managers. Furthermore, the results indicated that 22% of the participants knew family members or friends who were project managers and this could have contributed to the preference for this role. The construction program and environment presents several opportunities that focus on the role on the project manager, and this is extremely beneficial to the many students who have chosen to pursue this career path. Most of the female participants provided high ratings to the project management role. However, a few female students assigned high ratings to graduate school opportunities. Frequent reasons for assigning high ratings to the project management role included opportunity to lead, passion for the project management role, project manager role models, internships, challenging role, strong management skills, motivation by the accomplishments of project managers, good money, and having a parent who was a project manager. Salary was a major factor for students who participated in the study and preferred the project manager role. Furthermore, students viewed this role as the highest leadership role and they felt that the construction program prepared them best for this role, as most of the program content were towards the project manager role.

Closely following the project management role was the superintendent role (MPCRS = 7). This was particularly unexpected as the construction program does not place too much emphasis on the superintendent role, and furthermore, the results indicated that only 6% of the participants knew family members or friends who were superintendents. Participants who assigned high ratings to the superintendent role explained that they preferred these roles because the superintendent role was associated with high salaries, more hands-on work, outdoor environments, leadership, and having a high level of authority in the field. Currently, construction graduates tend to have strong backgrounds in estimating and scheduling, but appear to have limited practical preparation when it comes to serving in the role of a project superintendent. Some argue that in the past, superintendents were primarily very experienced tradesmen, and not necessarily undergraduate construction students. It must be noted though that in more recent times and on an increasing basis, employers are recruiting construction students for superintendent roles. The increased complexity of post-modern construction projects has led to some changes in roles such as the superintendent role, which in recent times requires increased use of technology and more administrative

responsibilities [4][16]. Consequently, employers are now hiring construction graduates to serve as superintendents on commercial project sites. From these results, it can be concluded that a significant percentage of students actually prefer superintendent roles. However, these students feel inadequate and poorly prepared to excel in these roles since they are provided limited learning opportunities that will enhance their transitions into the superintendent roles. Past construction graduates who are now in superintendent roles have expressed the wish that they had taken more surveying courses and more hands on school projects to better prepare them for the challenges associated with this role. These graduates however stated that the 600 hours of industrial experience required in the construction program had been very beneficial, as they had gained some exposure to construction field work prior to graduation. Notably, though, many construction organizations provide construction graduates with additional training opportunities to enhance smoother transitions into their new roles.

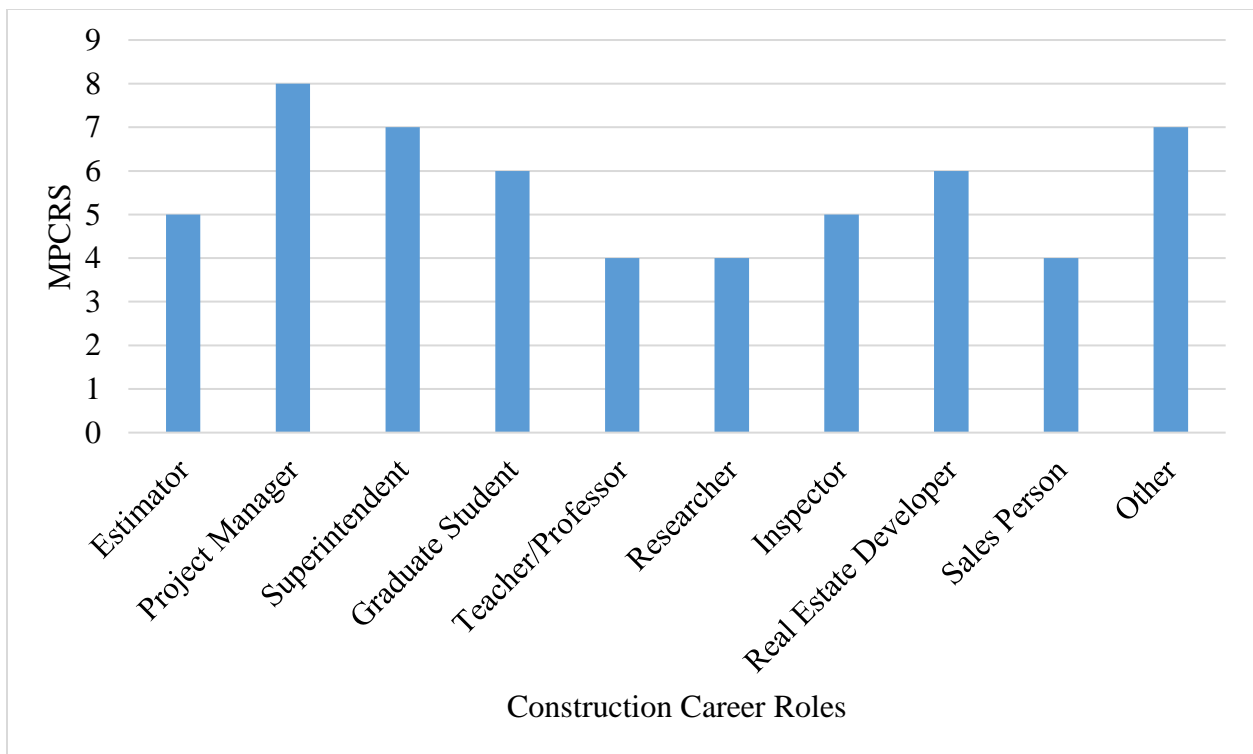


Figure 5. Mean Preferred Career Role Scores

Surprisingly, the third highly rated score (MPCRS =6) was not for the role of the estimator, but for graduate student and real estate developer. Furthermore, the results indicated that only 8% of the participants knew family members or friends who had completed graduate school. Students indicated that they would like to pursue graduate school because of their love for learning, additional preparation for their career, furthering their knowledge, and as a replacement for obtaining certifications. Courses that enhance transitions into graduate school such as statistics and research experiences are not available for students interested in graduate school. Perhaps, offering these course as electives or introducing new modules into existing courses to prepare students for graduate school would be beneficial to these students and increase their potential to be successful in graduate school. Students who assigned high ratings to real estate development explained their

passion for residential construction, love for selling, existing family business, and their desire to start their own business in real estate.

Despite the focus on estimating in this construction program, few students assigned their highest rating to this role and so it had an MPCRS of 5. Only 5% of the participants rated this role as their most preferred role. These students believed that they had great mathematical skills, a passion for precision, and a great interest in estimating. On the other hand, many of the other students who provided low ratings to estimating explained that their weak mathematical skills made estimating extremely challenging and boring to them. They were concerned about potential errors and miscalculations, and as such did not want employment in estimating roles. Considering that only 4% of the participants knew family members or friends who were estimators, the lack of role models may have also contributed to their low preference for this role. Additional investigations should be conducted into students' interests in the estimating role, since construction programs really invest a lot of resources into building the capacity of students to serve as estimators.

The inspector role also had an MPCRS of 5, as shown in figure 5. Most of the students who expressed interest in this role had a passion for inspections thought it was interesting figuring out what is wrong with a project and networking with other construction teams to get a little bit of both worlds. Also, these students had some prior experience with inspectors. One student had actually been an inspector prior to enrolling in the construction program. On the other hand, students who were not interested indicated that it sounded boring, needed knowledge of codes, and know more safety. Student comments indicated that they did not have a good understanding of the requirements of that role. As per previous discussions, this may be because this role is not the focus of the construction program. No student rated this role as their most preferred role, and as such, the best ratings were for second or third preferred construction role. Approximately 10% of the participants knew family members or friends who were inspectors and these role models may have contributed to their slight interest in this role.

With an MPCRS of 4, the least preferred roles were that of the teacher/professor, researcher, and sales person. Twenty-two percent of the participants knew family members or friends who were teachers/professors and these role models may have also contributed to their slight preference for this role. Only 4% of students knew family members or friends or were researchers and very few students really understood the role of researchers in the construction industry. However, 5% of the participants indicated that researcher role was their most preferred role. Considering there is really no emphasis on the role of the researcher in construction programs, this result was interesting. Indeed, there are a few construction students interested in the researcher role. Construction students who had been engaged in bio-modified concrete research had found the research experience to be very valuable and enhanced their perception about the researcher role. Their research experiences in swine-waste modified cement pastes had led to several publications, presentations, and poster sessions [18-20]. Construction students had so much identified with their student researcher role that they shared these research experiences during interviews with potential employers; and in one instance, research experiences had contributed to the attainment of a job offer. Also, 5% of the participants rated teaching as their most preferred role. Despite the fact that some construction students would like to pursue careers in academia, minimal educational opportunities are available in undergraduate construction programs to prepare students who are interested in construction teaching and research careers. Courses such as research methods,

research experiences, and statistics for more academic roles or for progression into graduate school are not commonly found in construction programs. Improvements in construction curricula would enhance the capacity of interested students to transition successfully into graduate school and then into academia. These academia roles are very critical in contributing to the training of the future construction workforce and advancement of construction innovation.

The low ratings provided to some roles may have been due to students' lack of knowledge about the characteristics and benefits of those roles, considering that they are not the focus of construction programs. Program improvements recommended by participants included more hands on activities, different teaching methods, innovative mentoring programs, more challenging work, more field trips, increased technology, enhanced collaboration between construction program and industry partners, availability of a variety of construction courses, more tutors, and internships.

Other future career roles listed for the 'Other' role for roles that were not predetermined on the survey were scheduling, tradesman, music engineer and automobile technician. While scheduling and tradesman were still within construction education, music engineering and automobile technology were not within the boundaries of construction education programs. These students were in the wrong major and immediate advisement would be necessary to guide their career decisions.

## Conclusion

Insights provided into students' career interests are valuable to educators and may be used to enhance student advisement, retention, and construction curriculum improvements. Current construction curricula are focus on preparing students for project management and estimating roles. However, in response to their own self-interests, some students have strong preferences for other construction roles that are not highlighted in many construction programs. Consequently, the gap has to be bridged as programs which provide educational resources that align with students' self-interest and their preferred career roles are better able to motivate students to pursue academic success, develop stronger career identities, and transition successfully into their preferred career roles. Increasingly students are gaining interest in the role of the superintendent, and employers are looking for undergraduate construction students to serve as superintendents to meet the increased complexity of post-modern construction projects. Furthermore, few students indicated interest in academic roles that will contribute to the development of the future construction workforce and contribute to construction innovation. Construction educators should endeavor to understand students' career preference roles as well as the needs of the construction industry. Beyond understanding, construction educators and administrators should modify construction curriculum to meet the current trends in the construction industry.

## References

[1] A.Nejat, M. Darwish, and T. Ghebrab, "BIM teaching strategies for Construction Engineering students," in Building Information Modeling (BIM): Proceedings of the 2012 American Society for Engineering Education (ASEE) Annual Conference and Exposition, San

Antonio, TX, June 10 - 13, 2012, Available: <https://peer.asee.org/bim-teaching-strategy-for-construction-engineering-students> . [Accessed March 17, 2018].

[2] W. Hughes and J.R. Murdoch, “Roles in construction projects: analysis and terminology”, Construction Industry Publications, Birmingham, 2001, ISBN 1852638982. Available: <http://centaur.reading.ac.uk/4307/>. [Accessed March 19, 2018]

[3] S. Fean, “The role of a project manager on real estate and construction projects”, Watchdog Real Estate Project Managers, Available: <http://watchdogpm.com/blog/the-role-of-a-project-manager-on-real-estate-and-construction-projects/> , [Accessed March 19, 2018]

[4] G. M. Gad, J. Cho, and G. Lomiento, “Fostering Disciplines' Understanding among Design and Construction Students through a Design-Build Senior Project” in *Merging Disciplines: Practice and Benefits: Proceedings of the 2017 American Society for Engineering Education (ASEE) Annual Conference and Exposition, Columbus, Ohio, June 25 - 28, 2017*, Available: <https://www.asee.org/public/conferences/78/papers/20146/view> . [Accessed March 17, 2018].

[5] G. W. Figress and R. G. Vogt, “Building Career-Ready Students through Multidisciplinary Project-Based Learning Opportunities - A Case Study” in *Project-Based Learning: Proceedings of the 2017 American Society for Engineering Education (ASEE) Annual Conference and Exposition, Columbus, Ohio, June 25 - 28, 2017*, Available: [https://www.asee.org/public/conferences/78/registration/view\\_session?session\\_id=7611](https://www.asee.org/public/conferences/78/registration/view_session?session_id=7611). [Accessed March 17, 2018].

[6] Y. Wang, “The impact of career identity on career development: A cross-cultural comparison among Chinese and Dutch Teachers”, Master’s thesis, Human Resource Development, Faculty of Behavioral Sciences, University of Twente Enschede, The Netherlands, March 2009.

[7] A. Godwin, “The Development of a Measure of Engineering Identity,” in *Engineering Cultures and Identities: Proceedings of the 2016 American Society for Engineering Education (ASEE) Annual Conference and Exposition, New Orleans, LA, June 26 - 29, 2016*, Available: <https://www.asee.org/public/conferences/64/papers/14814/view>. [Accessed March 17, 2018].

[8] J. Tsakissiris, “The role of professional identity and self-interest in career choices in the emerging ICT workforce”, Master’s thesis, School of Management, Faculty of Business, Queensland University of Technology, December 2015.

[9] K. L. Meyers, M. W. Ohland, A. L. Pawley, S. E. Silliman, and K. A. Smith, “Factors relating to engineering identity”, *Global Journal of Engineering Education*, vol. 14, no. 1, pp. 119 – 131, May 2012.

[10] F. W. Vondracek, and V. B. Skorigov, “Leisure, School, and Work Activity Preferences and Their Role in Vocational Identity Development,” *The Career Development Quarterly*, vol. 45, iss. 4, pp. 322 – 340, June 1997.

- [11] S. E. Brownell and K. D. Tanner, “Barriers to Faculty Pedagogical Change: Lack of Training, Time, Incentives, and...Tensions with Professional Identity?” *Cell Biology Education*, vol. 11, no. 4, pp. 339-346, 2012. doi:10.1187/cbe.12-09-0163.
- [12] C-S., Cho, C. Maze, S. L. Dika, and G. B. Bruce, “Enhancing Student Learning and Engagement in Construction Course using Service Learning” in *Crossing Boundaries - Service Learning and Interdisciplinary Teams: Proceedings of the 120<sup>th</sup> American Society for Engineering Education (ASEE) Annual Conference and Exposition, Atlanta, GA, June 23 - 26, 2013*, Available: <https://www.asee.org/public/conferences/20/papers/7573/view>. [Accessed March 17, 2018].
- [13] A.N. Ofori-Boadu, M. A., Shofoluwe, R. Kelley, E.R. Sowell, and R.B. Pyle, “Assessing the Impact of an Industry-led Professional Development Workshop on the 21st Century 'Soft' Skills of CM Students at an HBCU,” in *Beyond the academy: leveraging partnerships, internships, and outreach: Proceedings of the 2017 American Society for Engineering Education (ASEE) Annual Conference and Exposition, Columbus, Ohio, June 25 - 28, 2017*, Available: <https://www.asee.org/public/conferences/78/papers/18120/view>. [Accessed March 17, 2018].
- [14] J. Mwangi, “Structural Elective Course for Special Building Systems” in *Instructional Innovations and Global Issues in Architectural Engineering Education: Proceedings of the 120<sup>th</sup> American Society for Engineering Education (ASEE) Annual Conference and Exposition, Atlanta, GA, June 23 - 26, 2013*, Available: <https://peer.asee.org/structural-elective-course-for-special-building-systems>. [Accessed March 17, 2018].
- [15] G. Callanan and C. Benzing “Assessing the role of internships in the career-oriented employment of graduating college students,” *Education and Training*, vol. 46, no. 2, pp. 82-89, 2004, <https://doi.org/10.1108/00400910410525261>
- [16] E. A. Holt, J. M. Benham, and B. F. Bigelow, “Emerging Technology in the Construction Industry: Perceptions from Construction Industry Professionals” in *Mobile and Emerging Technologies in Construction: Proceedings of the 122nd American Society for Engineering Education (ASEE) Annual Conference and Exposition, Seattle, WA, June 14 - 17, 2015*, Available: <https://peer.asee.org/emerging-technology-in-the-construction-industry-perceptions-from-construction-industry-professionals> . [Accessed March 17, 2018].
- [17] S. Pepitone. One of the biggest industries in the country- construction – still has a big woman problem. *Commercial Observer*, February 1, 2017, Available: <https://commercialobserver.com/2017/02/one-of-the-biggest-industries-in-the-country-construction-still-has-a-big-woman-problem/>. [Accessed March 19, 2018]
- [18] A. N. Ofori-Boadu, R. Kelley, F. Aryeetey, E. Fini, and P. Akangah, “The Influence of Swine-waste Bio-char on the Early-age Characteristics of Cement Pastes”, vol. 7, no. 1, pp. 1 – 7, June 2017.

[19] A. N. Ofori-Boadu, R. Abrokwah, S. Gbewonyo, and E. Fini, "Effect of swine-waste bio-char treatment temperature on water absorption characteristics of cement pastes", *International Journal of Building Pathology and Adaption*, vol. 36, no. 2. May 2018 [IN PRESS]

[20] A. N. Ofori-Boadu, F. Aryeetey, R. Kelley, and E. Fini, "Hydration of modified cement pastes with swine-waste bio-char as a partial cement replacement material", *International Journal of Modern Engineering*, 2018 [IN-PRESS]