

INVESTIGATING THE PERCEPTIONS OF HISPANIC HIGH SCHOOL  
STUDENTS TOWARDS CONSTRUCTION MANAGERS

A Thesis

by

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## ABSTRACT

Since 1968 Americans have recognized September 15 to October 15 as Hispanic Heritage Month. Each year, we celebrate the history and culture of Hispanic and Latino Americans and their contributions to society. In 2014, Hispanics and Latinos accounted for 16.1 percent of the 146.3 million employed people in the United States. The Construction industry is the dominant employer of Hispanics. 90.5% of Construction managers are White, making that the most common race or ethnicity in the occupation, while about 29.8% of the workforce is made of Hispanic people. This creates a cultural and lingual gap among the managers and workers. One of the most common reasons for failure at a job site is miscommunication. This study focuses on investigating the perception of Hispanic Highschool students towards construction managers and creating awareness about what a construction manager does. This study follows a multidimensional surveying method with targeted groups of Hispanic Highschool students and parents. After analysis of the survey and sketches received from the participants, the study concludes that there is a significant misconception in the Hispanic community about what a construction manager profession looks like, where the construction manager is located and what does the construction manager does. The study also concluded that there is need to create awareness among students about the profession, to increase the likelihood of Hispanic students choosing construction management as their profession, thus decreasing the gap in the industry.

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## 1. INTRODUCTION

It is estimated that by year 2030, Hispanic/Latino, African-American, Asian and Pacific Islander communities will form the majority of the growth in the American workforce. Out of this communities Hispanic/Latino workforce is expected to be relatively highest approximately 78% (As Hispanic Workforce Grows, Communication is Job #1, 2015). At the recent International Builders' Show in Las Vegas, speaker Ricardo González, while giving an example of mismanagement at many companies causing an array of problems said, 'Upper management in America is usually White and English speaking, while Latino's and Spanish speaking population makes the labor force, this disparity between management and labor workforce creates language barriers. As a leader it is your responsibility to communicate with them' He said. 'If you cannot develop and leverage your workforce, it doesn't make sense to hire such a workforce'

With communication understanding cultural nuances is also critical. Most Hispanics/Latinos recognizes themselves most often by their country of origin. Due to significance difference between regions, people are proud of where they come from, and acknowledging or even recognizing these cultural differences among various workers makes for a good manager.

In the United States Hispanic workers play a central role in the construction industry and have a substantial impact on US construction activities. As of 2017, Hispanic workers constitute 29.8% (almost 3.2 million) of the US construction industry workforce—the largest percentage of any ethnic group in the construction industry (Bureau of Labor Statistics [BLS], 2017) (Figure 1).

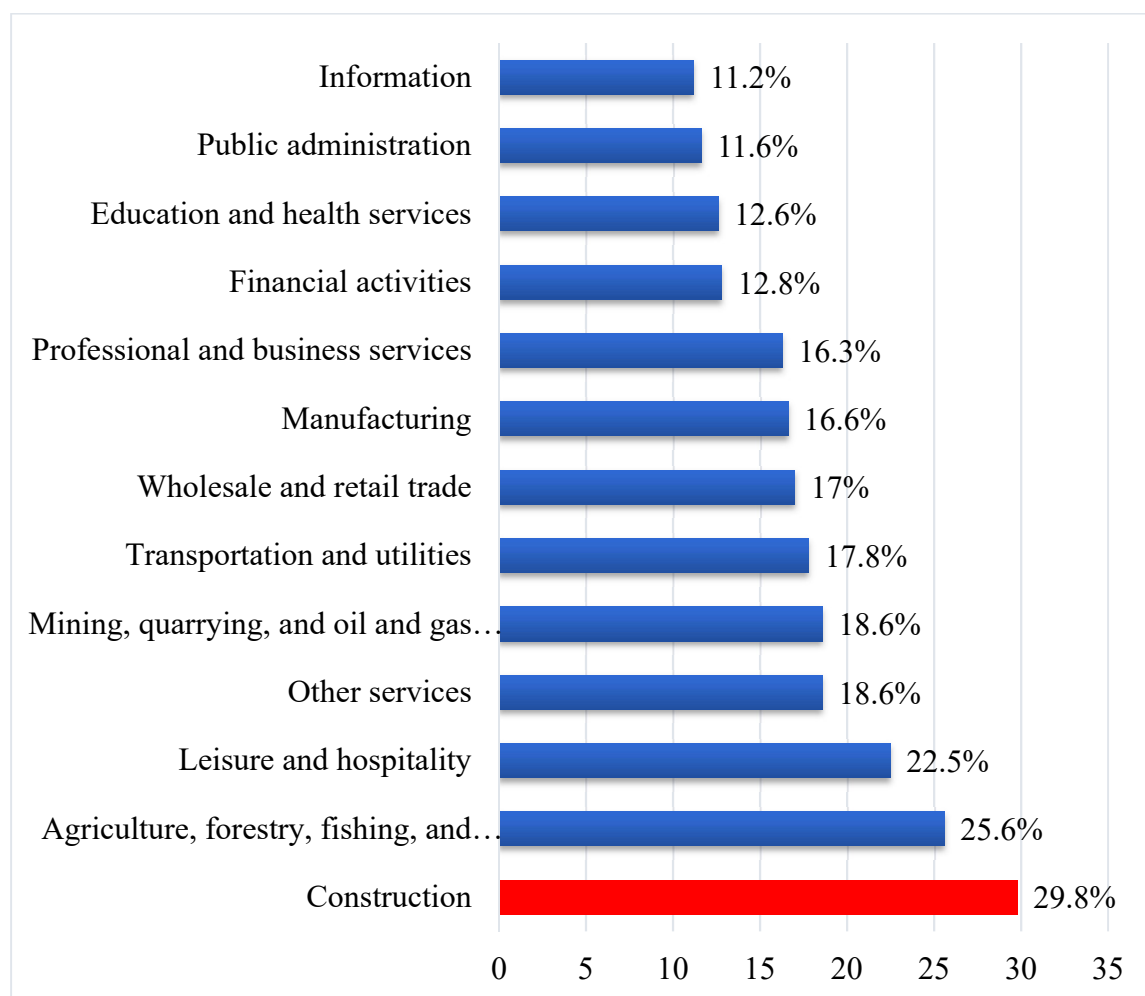


Figure 1. Percentage of Industry Employment That is of Hispanic or Latino Ethnicity, 2017 Annual Averages

But they still lag other population groups in obtaining bachelor's degrees (Figure 2): only 6.9% of Hispanics in the construction industry have a bachelor's degree or higher, and 46% of them have less than a high-school diploma (Center for Construction Research and Training [CPWR] Data Center, 2018).

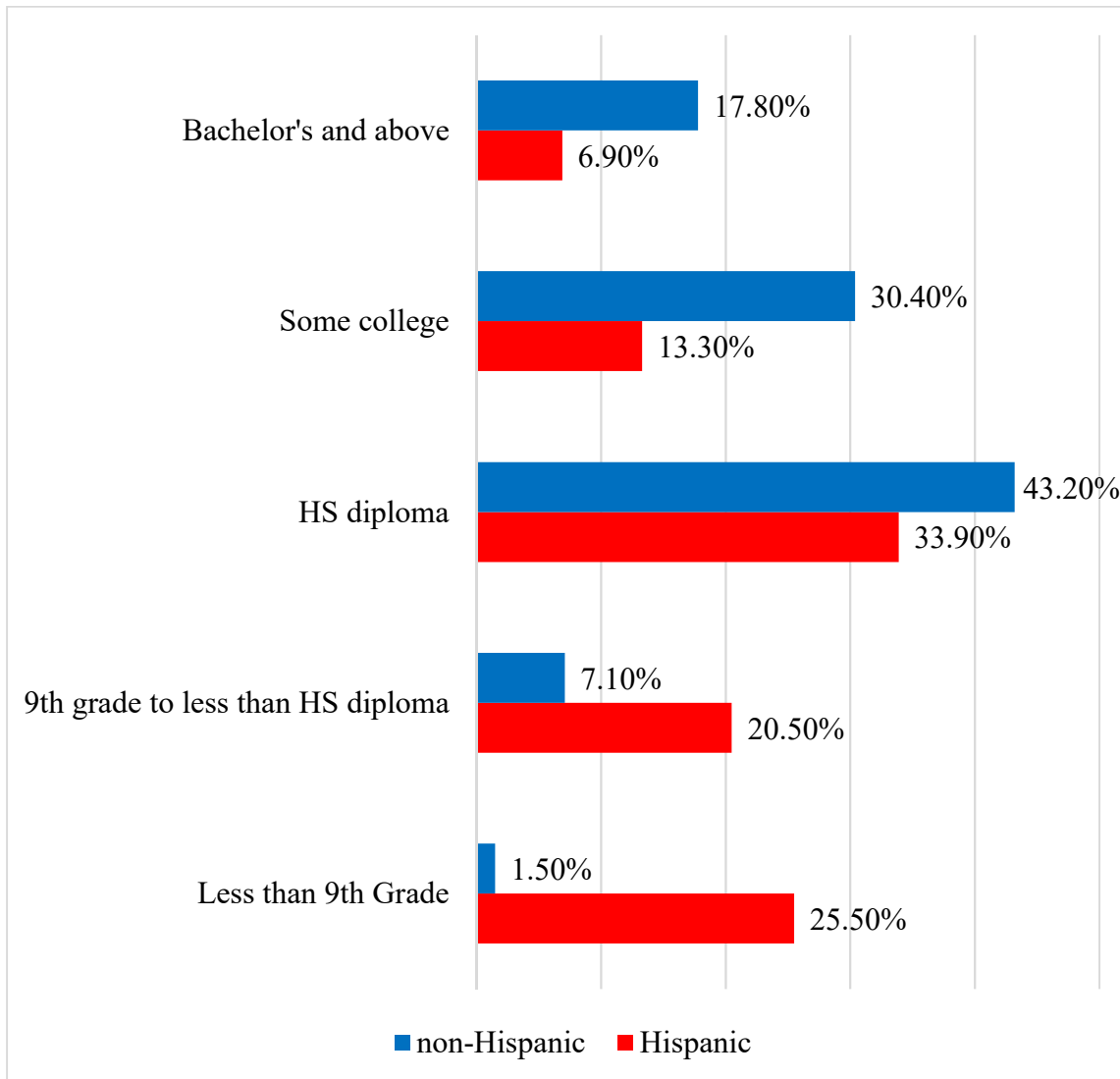


Figure 2. Distribution of Educational Attainment among Construction Workers, 2015  
(All Employment)

While Hispanics account for more than 45.5% of construction laborers, only about 11% of construction managers are Hispanic (BLS, 2016b), which can be attributed to the fact that they are underrepresented in management positions in construction careers.

### **1.1. Call for Hispanic Construction Managers**

While effective communication is critical for the successful implementation of any construction project (Escamilla et al., 2018, Pariafsai, 2016), it is a major problem in construction occupations. A study of 97 Hispanic construction craft workers on the heavy/highway and commercial projects in Iowa reported that 55% of workers identify a lack of communication as the main obstacle on the job site (Canales et al., 2009). In addition, (Dong et al. 2013), by analyzing nationally representative data from the 2008 Survey of Income and Program Participation, found that “more than 80% of Hispanic construction workers did not speak English at home and 37% of Hispanic construction workers did not speak English very well or did not speak English at all.” As of 2015, according to CPWR (The Center for Construction Research and Training) (2018), about 30% of construction workers speak a language other than English at home (nearly 86% of foreign-born construction workers report speaking Spanish at home). Failure to communicate effectively decreases the safety and productivity of construction workers (Escamilla et al., 2017)

Understanding cultural differences is just as crucial as communication (National Association of Home Builders [NAHB] Now, 2015). Hofstede (1991) defined culture as “the collective programming of the mind, which distinguishes the members of one group

or category of people from another” (p. 5). Brunette (2004) stated that once Hispanic workers immigrate to the US, they “bring with them varied histories, cultural sensibilities, strong health beliefs, and a different cultural background in comparison with non-Hispanic workers” (p. 246). One of the reason for lower morale, lower productivity, and higher accident rates is mismanaging cultural diversity (Loosemore & Lee 2002). In order to overcome language and cultural barriers, there is a call for bilingual and bicultural construction managers for foreman and supervisory roles in the construction industry.

## **1.2. Educational Qualification for Construction Managers**

Atalah and Muchemedzi (2006) have stated that “for many years, construction managers were either craft persons without a college education or graduates of an engineering program who were trained on the job”. 20 years ago, the management of construction companies changed significantly (Atalah & Muchemedzi, 2006). This represents the market with an increasing demand for well-educated managers in construction who can address the complexities found in construction projects with a substantial amount of project and construction management knowledge (Ayalp & Öcal, 2016). Typical requirement is a bachelor’s degree, management techniques are usually developed through on-the-job training. Bachelor’s degree in a construction-related field with construction experience is being increasingly preferred by large construction.

### **1.3. Problem Statement**

To increase the number of Hispanic construction managers in the U.S. market, there should first be growth in Hispanics earning construction science degrees (Escamilla et al., 2016, Escamilla & Ostadalimakhmalbaf, 2016). More students must be inspired for careers in construction to counter this challenge; however, according to research the perception of construction industry in high school students is negative. For example, a career as a construction worker was ranked 247 out of 250 occupation options by high school students (Krantz, 1999). Similarly, Jobs Rated researchers reported that out of 200 career opportunities, an employment as a construction laborer is ranked at 191 (Strieber, 2011).

As a result, it is imperative to assess and analyze students' perceptions of construction managers with a multidimensional approach. Parents play an important and a significant role in the development of students' perception and their future. It is also important to assess and analyze the perception of parents' as it develops into student's perceptions.

## 2. BACKGROUND

In early stages of growing children collect and store ideas long before they are able to verbalize about which career they might be interesting in which usually they see around while growing up (Farland-Smith, 2012).

One of the popular methods of probing the perceptions children hold of scientist is asking them to “draw a scientist” perceptions (Chambers, 1983; Finson, Beaver, & Cramond, 1995; Huber & Burton, 1995; Schibeci & Sorensen, 1983). These images usually are representations of stereotyped appearance of scientist including the objects included in the drawings like beakers, glasses or lab coats. There is an uncertainty on how students react to these images and how it impacts their attitude and learning environment. If the perception of students does not fit with them and their beliefs, it is unlikely that they will pursue it. Images of a particular occupation directly impacts students’ occupational preferences and career aspirations (Gottfredson, 1981). Because of a negative image of scientists, students may not even consider a career in science. These negative images may have been formed long before a career was ever considered (Fung, 2002).

One of the most effective method of probing perceptions of young students is to analyze the drawings, which will give a better understanding of how a student identifies with construction managers for a potential career in the construction industry. The information gathered through these analyzes are more than stereotypical, rather the information is multidimensional and provide multiple approaches to decipher the perceptions which can be very helpful for teachers and researchers to develop more interventions, for positively influencing the perceptions. As a result, this study explores

the possibilities of assessing and analyzing students' perceptions of construction managers with a multidimensional approach.



### 3. RESEARCH OBJECTIVE AND SIGNIFICANCE

#### **3.1. Objective**

The purpose of the study is to assess and analyze students' perceptions of construction managers with a multidimensional approach. Also, to assess and analyze the perception of parents' and its impact on student's perceptions.

#### **3.2. Significance**

This study is significant because it will provide an understanding of methods to effectively increase the construction workforce, that is grounded in the perceptions of current students and the parents.

#### 4. METHODOLOGY

The data collected for this study was done through a self-administered sketch paper and survey. The survey uses a Likert-type scale and multiple-choice questionnaire. Students' were asked to get parental permission before they were allowed to participate in the survey, and researchers secured an IRB approval prior to the commencement of the study. This study recruited 216 high school juniors from 19 school districts in South Texas, with 40% female participation.

This study employed participants on two levels:

- Treatment group: consisting of Hispanic high school students, Mothers, and Fathers.
- Control group: consisting of professionals working in the construction industry who graduated with an undergraduate degree in construction education.

Students and their parents were invited to an orientation dinner on the first night of eight construction management academies. During these sessions, a short, self-administered survey and sketch paper was conducted among students. The purpose of the survey and sketch papers was to obtain the views and understanding of the student sample about construction management as a profession. The total number of participants who had parental permission to complete surveys was 149.

Because this research focuses to explore Hispanic student's perceptions, it used purposeful sampling by using students enrolled in high schools with a dominant population of Hispanic students. A Purposeful sampling similar to a non-probable sampling (Tongco, 2007) in which "the participants are hand-picked from the accessible

population so that they presumably will be representative or typical of the population” (Gliner, Morgan, & Leech, 2009). Non-Hispanic students’ responses were removed from the data collected as the study focuses on Hispanic students.

To improve internal validity of the research, researchers employed a pilot study prior to starting the research. Hundley and van Teijlingen’s (2002) guidelines for pilot study procedures were followed. From a local high school ten juniors were selected. Two different trials were conducted for those students during the pilot study. The first trial was composed of three males and two females, while a second trial consisted of three females and two males. Each trial took about 10 to 12 minutes. At the end of each trial based on students’ input corrections and revisions were made to the survey to increase readability and comprehensiveness.

149 student sketches were considered are scored using Draw-A-Construction Manager rubric. 61 Mothers and 29 Fathers accompanied the students for this session and their sketches were also recorded for scoring.

These sketches were scored by two scorers, Dr. Donna Farland-Smith who published a similar study based on Draw-A-Scientist to develop a field test of modified Draw-A-Scientist test and rubric. Dr. Smith taught the author how the sketches are to be scored and how to use the Draw-A-Construction Manager rubric (in the appendix).

Rubric contained three categories – Appearance, Location, and Activity. Each category was scored between 0 – 3 based on the rubric. For the activity category, the treatment group was asked to write dialogues or comments on what the construction manager is doing in the sketch. Out of 239 sketches of treatment group, 36 sketches have

dialogues and comments written in the Spanish language. These sketches were translated to English for scoring purposes through a native Spanish speaker.

Dr. Smith scored 25 sketches with the research author and later both scored the remaining sketches individually. All the unmatched scores for sketches were later reviewed by Dr. Smith and the research author in an iterative process until a consensus was reached. Some of the sketches depicted certain characteristics about the perception of Mother, Father, and students. These sketches were sorted out and will be representatives of results in the appendix.

The scores were then tabulated with respect to these categories. To analyze these scores, percentages were calculated for each category and each group namely Students, Mothers and Fathers depending on the score it received.

## 5. RESULTS

### 5.1. Mothers

A total of 61 Draw-A Construction Manager sketches were collected from mothers during the study. During the scoring of these sketches, 28 sketches received a '0' score because of lack of evidence of construction managerial appearance, location or activity. That is about 45.90% of sketches were removed from the final tally of the results because it is unclear if the mothers did not know of what was being asked of them, what a construction manager looks like, where the construction manager is located, or what the construction manager does. The other assumption is that the mothers might not have taken the study seriously and may have drawn something unrelated to finish the sketch quickly, thus not giving a proper response.

The scores of the remaining 33 sketches were tabulated as shown in the table below.

<b>Mothers</b>						
<b>Score</b>	<b>Appearance</b>	<b>%</b>	<b>Location</b>	<b>%</b>	<b>Activity</b>	<b>%</b>
<b>1</b>	0	0.00	0	0.00	7	21.21
<b>2</b>	26	78.79	18	54.55	20	60.61
<b>3</b>	7	21.21	15	45.45	6	18.18
<b>Total</b>	33	100	33	100	33	100

Table 1. Compilation of scores from the Mothers' sketches.

## 5.2. Fathers

A total of 29 Draw-A Construction Manager sketches were collected from fathers during the study. During the scoring of these sketches, 6 sketches received a '0' score because of lack of evidence of construction managerial appearance, location or activity. That is about 20.69% of sketches were removed from the final tally of the results because it is unclear if the fathers did not know of what was being asked of them, what a construction manager looks like, where the construction manager is located, or what the construction manager does. The other assumption is that the fathers might not have taken the study seriously and may have drawn something unrelated to finish the sketch quickly, thus not giving a proper response.

The scores of the remaining 23 sketches were tabulated as shown in the table below.

Fathers						
Score	Appearance	%	Location	%	Activity	%
1	0	0.00	0	0.00	7	30.43
2	23	100	20	86.96	13	56.53
3	0	0	3	13.04	3	13.04
<b>Total</b>	23	100	23	100	23	100

Table 2. Compilation of scores from the Fathers' sketches.

### 5.3. Students

A total of 149 Draw-A Construction Manager sketches were collected from students during the study. During the scoring of these sketches, 46 sketches received a '0' score because of lack of evidence of construction managerial appearance, location or activity. That is about 30.87% of sketches were removed from the final tally of the results because it is unclear if the students did not know of what was being asked of them, what a construction manager looks like, where the construction manager is located, or what the construction manager does. The other assumption is that the students might not have taken the study seriously and may have drawn something unrelated to finish the sketch quickly, thus not giving a proper response.

The scores of the remaining 103 sketches were tabulated as shown in the table below.

Students						
Score	Appearance	%	Location	%	Activity	%
1	0	0.00	2	1.94	40	38.84
2	86	83.50	76	73.79	59	57.28
3	17	16.50	25	24.27	4	3.88
<b>Total</b>	103	100	103	100	103	100

Table 3. Compilation of scores from the Students' sketches.

## 6. DISCUSSIONS AND CONCLUSION

### 6.1. Discussions

During the study, the author found that the perception of a student is not only influenced by their knowledge of construction manager but also the exposure and their parent's knowledge of construction management profession and a construction manager. This can be reiterated through the results of the study.

During the administration of the Draw-A-Construction manager study parents were allowed to accompany the students and take the test as well. A total of 149 students participated in the study. Some students were accompanied by one or both of their parents with a total of 61 mothers and 29 fathers while remaining students were not accompanied by any of their parent. This statistic shows that mothers are more involved in their children's education than fathers. This also shows that in Hispanic community fathers are considered more of the earner for the family while mothers take care of the children and their education.

#### 6.1.1. Mothers' perception of Construction Manager

Out of the 61 mothers that participated in the study, 28 mothers received a '0' score suggesting that about 46% of mothers did not know what a construction manager looks like, where a construction manager is located, or what the construction manager does.

Remaining 33 sketches were scored separately on three categories – Appearance, Location, and Activity from a score of 1 to 3 using Draw-A-Construction Manager rubric.



Appearance - 26 mothers got a score of 2 while 7 got a score of 3. This shows that 78.79% of mothers have a traditional perception of construction manager and 21.21% of mothers have broader than traditional perception of what a construction manager looks like.

Location - 18 mothers got a score of 2 while 15 mothers got a score of 3. This shows that 54.55% of mothers have a traditional perception of construction manager and 45.45% of mothers have broader than the traditional perception of where a construction manager is located.

Activity - 7 mothers got a score of 1, 20 mothers got a score of 2 while 6 mothers got a score of 3. This shows that 21.21% have a sensationalized perception of construction manager, 60.61% have a traditional perception of construction manager and 18.18% of mothers have broader than the traditional perception of what a construction manager does.

### **6.1.2. Fathers' perception of Construction Manager**

Out of the 29 fathers that participated in the study, 6 fathers received a '0' score suggesting that about 21% of fathers did not know what a construction manager looks like, where a construction manager is located, or what the construction manager does.

Remaining 23 sketches were scored separately on three categories – Appearance, Location, and Activity from a score of 1 to 3 using Draw-A-Construction Manager rubric.

Appearance - 23 fathers got a score of 2. This shows that 100% of fathers have a traditional perception of what a construction manager looks like.

Location - 20 fathers got a score of 2 while 3 fathers got a score of 3. This shows that 86.96% of fathers have a traditional perception of construction manager and 13.04% of fathers have broader than the traditional perception of where a construction manager is located.

Activity - 7 fathers got a score of 1, 13 fathers got a score of 2 while 3 fathers got a score of 3. This shows that 30.43% have a sensationalized perception of construction manager, 56.53% have a traditional perception of construction manager and 13.04% of fathers have broader than the traditional perception of what a construction manager does.

### **6.1.3. Students' perception of Construction Manager**

Out of the 149 students that participated in the study, 46 students received a '0' score suggesting that about 31% of students did not know what a construction manager looks like, where a construction manager is located, or what the construction manager does.

Remaining 103 sketches were scored separately on three categories – Appearance, Location, and Activity from a score of 1 to 3 using Draw-A-Construction Manager rubric.

Appearance - 86 students got a score of 2 while 17 got a score of 3. This shows that 83.50% of students have a traditional perception of construction manager and 16.50% of students have broader than the traditional perception of what a construction manager looks like.

Location – 2 students got a score of 1, 76 students got a score of 2 while 25 students got a score of 3. This shows that 1.94% have a sensationalized perception of construction

manager, 73.79% of students have a traditional perception of construction manager and 24.27% of students have broader than the traditional perception of where a construction manager is located.

Activity - 40 students got a score of 1, 59 students got a score of 2 while 4 students got a score of 3. This shows that 38.84% have a sensationalized perception of construction manager, 57.28% have a traditional perception of construction manager and 3.88% of students have broader than tradition perception of what a construction manager does.

## **6.2. Conclusion**

About 46% of mothers that participated got a score of zero, 21% of fathers that participated got a score of zero while 31% of students got a score of zero. This statistic shows that the percentage of mothers who didn't have the correct perception of the construction manager was much higher than that of fathers. While the percentage of students was somewhere in between them.

Mothers being more involved in children's education and having an incorrect or negative perception about construction managers impact the perception of students' as well. The results also show that fathers being away most of the time for their respective jobs have a little or no impact on student's perception of construction managers.

About 84% of students' perception about the appearance of the construction manager is quite traditional, being a standard looking white man while 16 % of students consider the construction manager to be a female or other ethnicity.

About 74% of student's perception about the location of the construction manager is traditional, being on a construction site while 24% of students consider the location to be other than the construction site.

About 39% of students' perception about what a construction manager does is sensationalized indicating that students' believe that construction manager's work is unrealistic and their work does not make any construction sense, 57% of students' perception about what a construction manager does is traditional indicating that student sees the construction manager involved in work that is miraculous in nature making some construction sense while only 4% of students have broader than traditional perception of what a construction manager actually does making near-perfect sense of construction management.

This study concludes that there is a significant misconception about construction managers and construction management among Hispanic students and their parents. This study produces significant evidence that there is a need to increase awareness among the Hispanic community about Construction Managers and Construction Management. Only through proper knowledge about the profession is it possible that more Hispanic students will choose construction management as a potential career path. This may increase the number of Hispanic construction managers in the industry leading to better management of construction projects by a better understanding of Hispanic culture and good communication.

### **6.3. Further Studies**

This study has helped to probe into the perception of Hispanic high school students and their parents towards the role performed by a construction manager and the construction management profession. A similar study can be conducted to probe into the perception of students about facility managers and facility management as a potential career choice. According to iOffice Corporation, there are many misconceptions about facility managers and facility management as it is a male-dominated role, that facility managers do not need professional training. Most people think that a facility manager is a person with a tool belt around the waist ready to fix the problem at hand (Dukes, 2016).

These misconceptions need to be studied and researched further to understand the misconceptions, causes and how we can create awareness among students for a better understanding of the profession.

## REFERENCES

- As Hispanic Workforce Grows, Communication is Job #1. (2015, February 16).  
Retrieved from National Association of Home Builders:  
<http://nahbnow.com/2015/02/as-hispanic-workforce-grows-communication-is-job-1/>
- Ayalp, G. G., & Öcal, E. M. (2016). Determining Construction Management Education Qualifications and Effects of Construction Management Education Deficiencies of Turkish Construction. *Creative Education*, 254-268.
- Brunette, M. J. (2004). Construction safety research in the United States, targeting the Hispanic workforce. *Injury Prevention*, 10(4), 244–248
- Canales, A. R., Arbelaez, M., Vasquez, E., Aveiga, F., Strong, K., Walters, R., & Jahren, C. T. (2009). Exploring training needs and development of construction language courses for American supervisors and Hispanic craft workers. *Journal of Construction Engineering and Management*, 135, 387-396
- Dong X, Wang X, Largay J, Waddoups CJ, Fujimoto A. (2013). The impact of language barriers on healthcare utilization among Hispanic construction workers. In Owen T Jackson; Kathleen A Evans (Eds.), *Health Disparities: Epidemiology, Racial/Ethnic and Socioeconomic Risk Factors and Strategies for Elimination*. Hauppauge, NY: Nova Science Publishers, Inc. pages 161-176.
- Dukes, E. (2016, June). 5 Common Myths About Facilities Managers that Need Busted. Retrieved from iOffice Corporation: <https://www.iofficecorp.com/blog/5-common-myths-about-facilities-managers-that-need-busted>

- Escamilla, E., & Ostadalimakhmalbaf, M. (2016). Capacity Building for Sustainable Workforce in the Construction Industry. *The Professional Constructor*, 41(1), 51-71.
- Escamilla, E., Ostadalimakhmalbaf, M., & Bigelow, B. F. (2016). Factors Impacting Hispanic High School Students and How to Best Reach Them for the Careers in the Construction Industry. *International Journal of Construction Education and Research*, 12(2), 82-98. doi:10.1080/15578771.2015.1077296.
- Escamilla, E., Ostadalimakhmalbaf, M., & Saseendran, A. (2017). Hispanic Workers: Identification of Factors Impacting Fatal and Non-Fatal Injuries in the US Construction Industry. *The American Institute of Constructors*, 42(2), 61-75.
- Escamilla, E. F., Ostadalimakhmalbaf, M., Pariafsai, F., Gragera, C., & Alizadeh, M. N. (2018). Enrollment, Retention, and Graduation patterns of Higher-Education Construction Science Students at Texas A&M University: A Comparative Study. *The Professional Constructor Journal of the American Institute of Constructors*, 43(1), 48-61.
- Escamilla, E. F., Ostadalimakhmalbaf, M., Pariafsai, F., Ranka, N., Danesh, M., & Naderi Alizadeh, M. (2018). Impact of Using iPad Tablets in a Construction Communication Graphics Class: Evaluation Based on System Usability Scale. *Journal of Educational Technology Systems*, 0047239518773744.
- Farland-Smith, D. (2012). Development and Field Test of the Modified Draw-a-Scientist Test and the Draw-a-Scientist Rubric. *School Science and Mathematics*, 109-116.

Hofstede, G. (1991). *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

Loosemore, M. & Lee, P. (2002). Communication problems with ethnic minorities in the construction industry. *International Journal of Project Management*, 20(7), 517–524.

Pariafsai, F. (2016). Effectiveness of a Virtual Project-Based Simulation Game in Construction Education. *International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET)*, 2(5), 377-393.



## APPENDIX A

### **Sketch Paper Task**

Imagine that tomorrow you are going on a trip (anywhere) to visit a construction manager in a place where the construction manager is working right now. Draw the construction manager busy with the work this construction manager does. Add a caption, which tells what this construction manager might be saying to you about the work you are watching the construction manager do.

APPENDIX B

**Draw - A - Construction Manager Rubric**

Directions: award points for each category

Student Code # \_\_\_\_\_

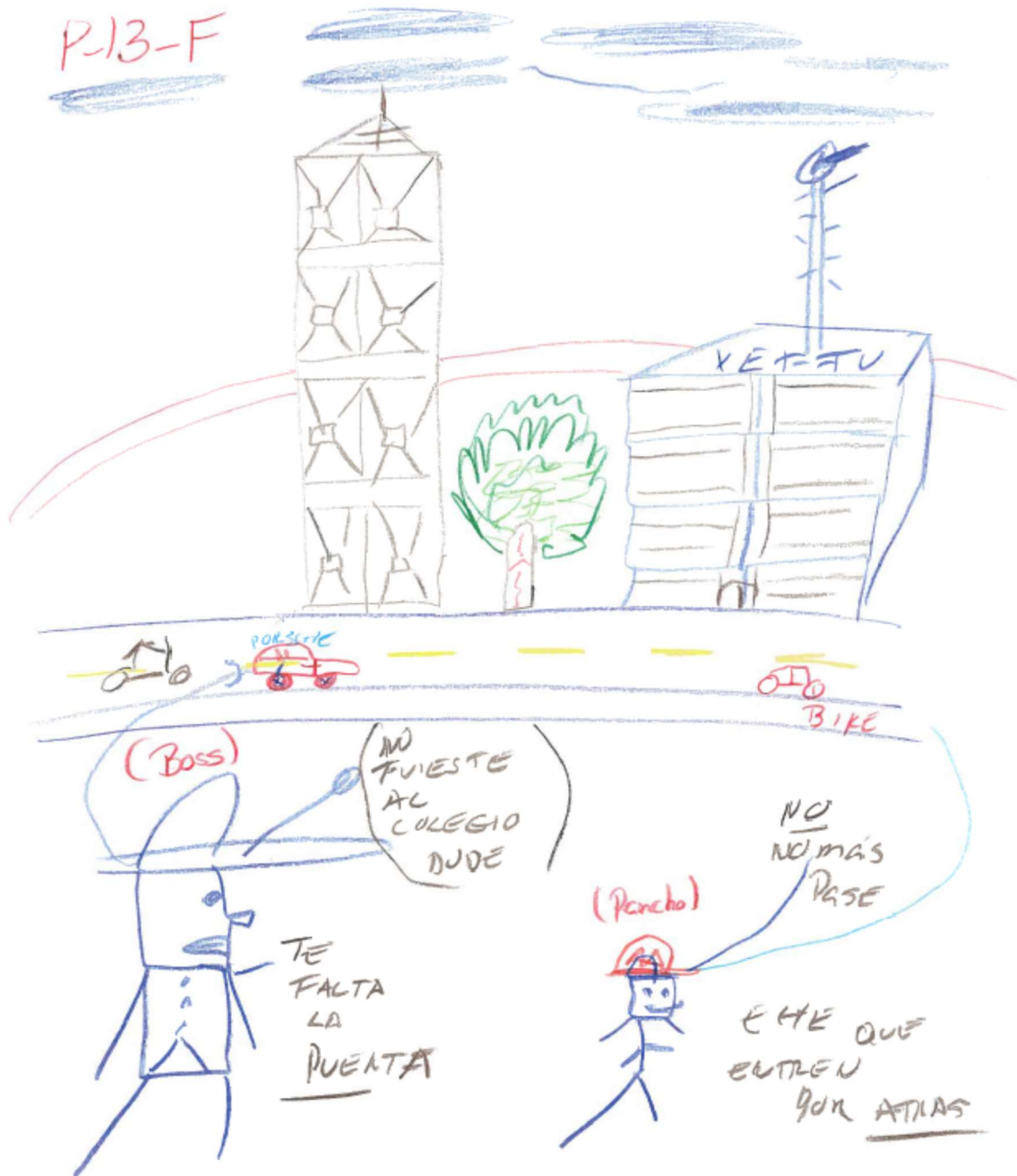
<b>Attribute</b>	<b>Sensationalized</b>	<b>Traditional</b>	<b>Broader than Traditional</b>	<b>Cannot be Categorized</b>
<b>APPEARANCE</b> (also refers to question #2)	Male or female who resembles a monster like figure, or who has a clear geeky appearance.	Standard looking White male or standard looking construction worker/manager unable to determine gender. This figure clearly lacks any references that are bizarre.	A Female, a person from different ethnicity, or two or more construction manager.	No construction manager Historical figure Reflects teacher or student. Difficult to discern.
Student's Score	1	2	3	0
<b>LOCATION</b> (also refers to question #3)	Resembles a basement, cave or setting of secrecy and/or horror. Often elaborate, with equipment not normally found on a construction site.	Traditional construction site setting, a building being built with equipment used, trades, etc.	Anywhere other than a traditional construction site setting.	Difficult to understand
Student's Score	1	2	3	0
<b>ACTIVITY</b> (from question #4 & support from caption)	Indicates that the student believes that the construction manager's work is unrealistic. Limited sense of what a Construction Manager does. Makes no construction sense.	Indicates that the student sees the CM involved in work that is miraculous in nature (naïve on the part of the student), not destructive. This activity makes some construction sense. (CMs can build whatever they want, however they want, etc) or the student writes, "The CM is studying or is trying to..." But does not show how the CM is studying or researching.	Indicates that the student is portraying the type of work that a CM might actually do with the tools needed. Trying to build a building, operate equipment, read drawings, etc. OR the student writes "The CM is studying..." and the caption or drawing shows HOW the construction manager is doing this.	No answer to question #4 Difficult to discern
Student's Score	1	2	3	0

APPENDIX C

What does a CM look like? (Sketch Results)



Figure 3 - Control Group Sketch



**Figure 4 - Father's Sketch**  
(Parent-13-Father = P-13-F)



*Figure 5 - Mother's Sketch  
(Parent-13-Mother = P-13-M)*

S-13



**Figure 6 - Student's Sketch**  
**(Student-13 = S-13)**