

Examining Construction Management Students' Experiences with Construction Accidents

Carla Lopez del Puerto, Ph.D.
Colorado State University
Fort Collins, CO

This paper examines construction management students' personal experiences with construction related accidents. Students were asked to write a case study of a construction accident that they had experienced or witnessed. Students were also given the choice to interview somebody that had either experienced or witnessed a construction accident. The objective of the assignment was to increase awareness about the magnitude and frequency of accidents in the construction industry and to develop solutions to prevent accidents from occurring on the jobsite. This author concludes that a large number of students have either experienced or witnessed construction accidents and that preventive measures should be taken to reduce the risk of being involved in future construction accidents. It also became apparent that students benefited from sharing with each other about their accident experiences. This was particularly important for students who have had limited exposure to the construction industry.

Key Words: construction accidents, case study; safety management, construction management curriculum

Introduction

Construction jobsites are some of the most dangerous workplaces. In 2007 there were 1178 fatalities resulting from construction accidents (BLS 1, 2008). Construction workers also experienced 135,350 illnesses and injuries resulting in an incident rate (IR) of 190 per 100,000 workers (BLS 2, 2008). According to the Occupational Safety and Health Administration (OSHA), the four most common causes of fatalities in the construction industry are:

- *Falls:* Falls are the leading cause of fatalities resulting in approximately one third of all fatalities in the construction industry (OSHA, 2001). The majority of falls occur at elevations of less than 30 feet and are due to the worker misjudging the amount of risk involved (Huang & Hinze, 2003). The OSHA standard 1926.501(b)(1) requires that "Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems" (OSHA, n.d.).
- *Struck-by objects or heavy equipment:* Workers are at risk for being struck by objects or heavy equipment when they are working on construction sites, especially hit by falling objects when working near or beneath scaffolds with work occurring overhead. Measures such as toe boards and debris nets prevent material from falling and striking construction workers below. Construction workers are also in danger of being struck by heavy equipment such as cranes and dump trucks. In order to minimize the risk of heavy equipment related accidents on construction jobsites, signs and signals such as flashing lights and flaggers are used to warn workers about the nearby hazards. Barricades are often used to prevent the passage of construction workers near or behind vehicles (OSHA, nod.).
- *Excavations:* The most common cause of fatalities related to excavation are cave-ins. Cave-ins can be prevented by sloping the sides of the excavation away from the excavation or trench (sloping) or by providing a structural system that supports the sides of the excavation (shoring) or use of trench boxes (OSHA, n.d.). Cave-ins present additional hazards including asphyxiation due to lack of oxygen in a confined space, inhalation of toxic fumes and drowning from water infiltration (OSHA, 2001).
- *Electrical Incidents:* Construction workers regardless of their trade are exposed to electrical incidents. Contact with overhead power lines when using cranes or simply having direct contact with a power source is a common cause of electrical incidents. OSHA requires that workers assume that power lines are energized at all times unless otherwise told. It is always recommended that equipment is kept at least 10 feet away from

power lines and other energy sources. Other causes of electrical incidents include lack of ground-fault protection, equipment not used in the manner prescribed, such as j-boxes used for temporary work, and improper use of extension cords and damaged cords (OSHA, 2001)

In addition to the four most common causes of fatalities in construction, power tools are common sources of serious accidents. The same tools that make construction work easier and improve productivity have the potential to cause very serious accidents. Power-tools are often classified based on the power source and capacity. Power tools can be electric, pneumatic, liquid fuel, hydraulic, or powder-actuated (OSHA, 1996). Construction workers often remove safeguards from power tools to expedite the process and use the power tools in ways that they were not designed to be used. Safe guards are physical barriers that prevent the worker from being in contact with dangerous machine parts. Amputations can result from a worker removing a safeguard as well as other injuries or even death. The most common form of amputation is finger amputations (OSHA, 1996). Another hazard resulting from the use of power tools are foreign particles in the eyes. This hazard can be reduced with the proper use of safety glasses or safety goggles (OSHA, 1996).

The American Council for Construction Education (ACCE) recommends that construction management students are involved in field trips to construction jobsites and construction related internships. While there are many advantages in having students exposed to construction jobsites during their academic years, these events also expose students to a wide array of hazards commonly encountered in the construction industry. This paper explores construction management students' experiences with construction accidents through self-reported case studies.

Objective

This paper examines construction management students' personal experiences with construction related accidents. Students were asked to write a case study of a construction accident that they had experienced or witnessed. Students were also given the choice to interview somebody that had either experienced or witnessed a construction accident. The objective of the assignment was to increase awareness about the magnitude and frequency of accidents in the construction industry and to develop solutions to prevent accidents from occurring on the jobsite. The goal of the assignment was for students to have in-depth knowledge about at least one construction accident that had involved somebody that the students personally know. The author believes that the personal connection is essential for students to understand that accidents can happen to anyone.

Case Studies

Case studies can be used to gain insight on in-depth personal perspectives about attitudes, behaviors, meanings, and experiences by obtaining details from a number of relevant or involved sources related to a project (Taylor et al. 2009; Yin, 2002). The U.S. Government Accounting Office states that interviews can be used where "information must be obtained from program participants or members of a comparison group... or when essentially the same information must be obtained from numerous people for a multiple case-study evaluation" (GAO, 1991).

Students in the junior level CON 317 Safety Management course at Colorado State University were asked to write a case study of a construction related accident that they had experienced or witnessed. Students were also given the choice to interview somebody that had either experienced or witnessed a construction accident. Students also provided their reflection on how the accident impacted the injured workers, their families, their co-workers and ultimately society.

After the students turned in their assignments the instructor classified the case studies based on the role the student played in the accident. The three possible roles were: 1) the student was the injured in the accident, 2) the student witnessed the accident involving another person or 3) the student interviewed somebody who either experienced or witnessed an accident. The case studies were also classified based on the type of accident that occurred and whether or not the accident resulted in a fatality.

Results

There were 83 assignments collected from students enrolled in one of the three safety management sections offered in Fall of 2010. As shown in figure 1, seven percent of students described a construction accident that they had experienced firsthand. Twenty five percent of students described an accident that they had witnessed while working on a construction site and 68% of students interviewed somebody to complete their assignment.

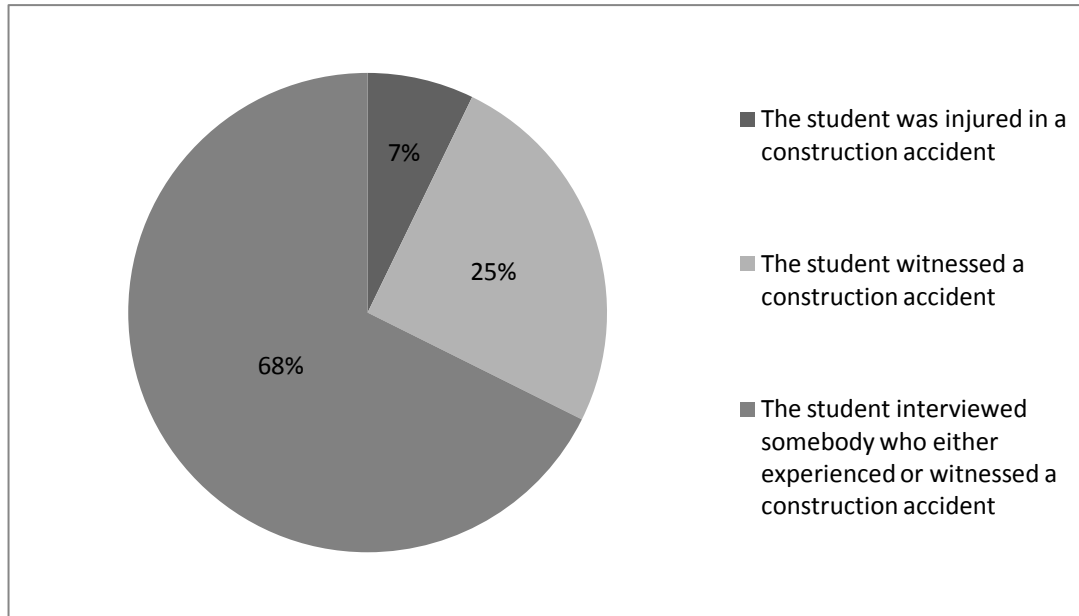


Figure 1: Percentages of accident by type of involvement

The frequency of each accident type is shown in figure 2. As presented in figure 2, accidents caused by power-tools were the leading cause of accidents followed very closely by falls. The majority of power-tool injuries involved construction workers accidentally severely injuring or amputating their fingers while using the power tools. Falls were the second cause of accidents and the number one cause of fatalities. This correlated with OSHA's finding that falls are the leading cause of fatalities in the construction industry (OSHA, 2001). Of the twelve fatalities that students reported, only one occurred when a student was present on the construction jobsite. Six construction management students who completed the assignment out of 83 assignments (7%) had been injured in a construction jobsite. The reported leading cause of injuries was improper use of power tools such as grinders and nail guns.

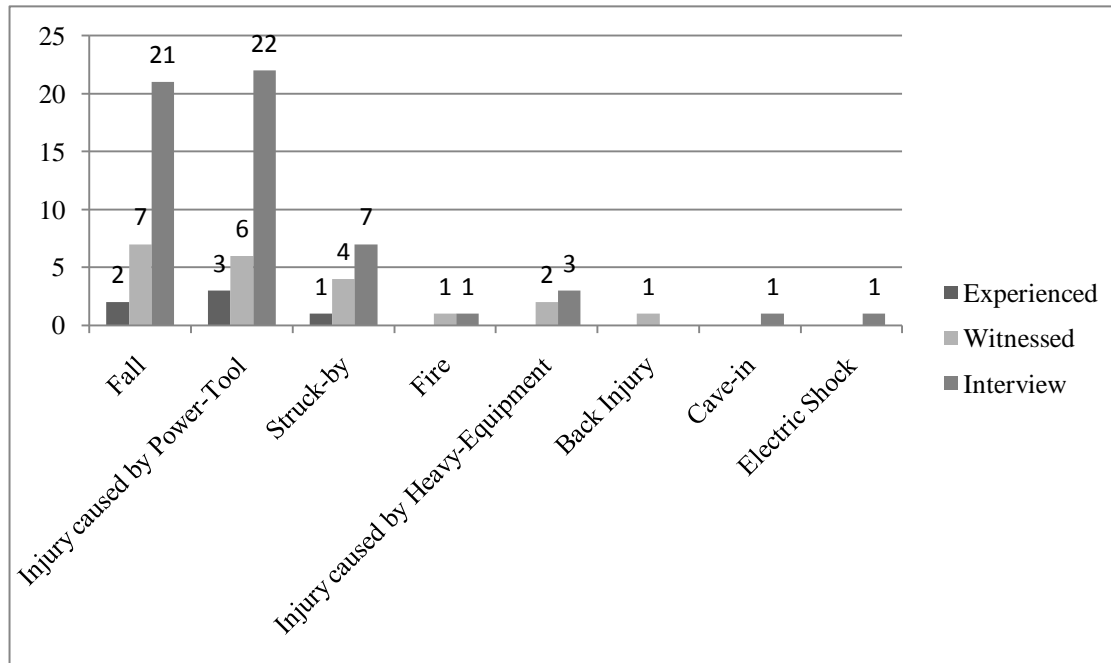


Figure 2: Frequency of each accident type

Table 1: Construction Management Students' Injuries

Injury Description	Consequence
40 feet wall fell on the student striking his shoulder and landing on his leg	Bruising, project lost one week worth of work.
The student severely injured his thumb while using a grinder. The student had removed the safeguard to finish the job faster.	Stitches.
Blade slipped and sliced the student's finger to the bone	Stitches.
The student fell in a hole while carrying a 200 pound furnace.	Twisted ankle, bruising
The student fell off the roof to the ground 20 feet below.	Broken shoulder and wrist, five surgeries, physical therapy, counseling.
The student was cutting rebar with the wrong blade. It snapped destroying the abrasive blade and shattering the saw guard. A piece of the blade cut through his shirt and vest.	Cut and large bruise.

The accidents were divided into two categories: the first category included accidents that the students had experienced or witnessed first hand and, the second category included accidents that the students had learned about through interviews of others. The rationale for classifying into the two categories was that in the first category students were on the jobsite at the time the accident happened, while in the second category the students were not on the jobsite. The temporal nature of the accidents is uncertain and they could have occurred before the students entered the construction industry. Almost a third of our students (32%) were present on the construction jobsite when an accident occurred. The students presented their case studies to the class.

It was clear that the case-study information increased their awareness about the hazards in the construction industry and the impact of accidents on injured workers, their families, their co-workers and ultimately society. Additional student feedback was solicited online by asking if they would have found value in knowing more about construction safety prior to taking CON 317 Safety Management. The question was asked using the blackboard learning platform to collect the responses anonymously. As shown in table

the majority of students (73%) expressed that they would have liked to learn more about construction safety during entry-level courses.

Table 1: Construction Management Students' Injuries

Question	Response	
I would have liked to know more about construction safety prior to taking CON 317 Safety Management (i.e., an intro to safety in an entry level course)	Yes	No
	73%	27%
Please provide feedback regarding the assignment	Sample Student Feedback: “The case study greatly improved my understanding of accidents and alerted me to the dangers several of my class mates faced during their internships/work experience. I know discussing my accident helped me understand the proper precautions I need to follow in future dangerous activities”	

Conclusions

Construction management faculty and staff must be aware of the hazards that undergraduate students are exposed to during their degree programs.

Construction safety is a topic that is taught most of the time close to the end of ACCE accredited Construction Management degree programs. Many construction management students enter the construction industry before they graduate from their programs. Students become exposed to construction hazards very early on their education through personal work experience or manual work on construction jobsites as a way to supplement their income. Furthermore, construction management programs often require jobsite visits, work experience and internships to fulfill their graduation requirements to ensure familiarity with the work process, tools, culture and environment. Construction management students at Colorado State University expressed that they would have liked to learn more about construction safety during entry-level courses. In light of these findings, construction management programs should explore when in their program their students would benefit the most from construction safety courses. Some of the questions that construction management programs may explore are:

- Would it be beneficial to our students to have a stronger emphasis on safety in the first year of their construction management degree?
- If construction safety were taught early during the students' degree, would they have enough knowledge about construction to understand the topics covered (for example, the difference between slopping and shoring excavations)?
- Would it be beneficial to our students to move the case study assignment to an entry-level course?
- Would moving the case study assignment to an entry-level course negate most of the experience that so many of our students have in which they have witnessed or experienced an accident?

Based on the results of this self-report assignment that indicated that the leading two causes of accidents for construction management students are improper use of power tools and falls, the instructor modified the CON 317 Safety management course content. The new course content includes in-depth review of OSHA subpart I: tools – hand and powered and subpart M: fall protection. Particular emphasis is placed on reviewing the types of power tools used in the construction industry, their potential hazards, the training required to use them properly and the personal protective equipment required to keep workers safe. Emphasis is also placed in fall prevention strategies and fall protection. Encouraging students to present their case studies to the class benefited all students and the instructor. The presenters improved their presentation and communication skills while the rest of the students learned about real construction accidents, impacts and strategies that might prevent those accidents from occurring in the future. Select case studies were compiled and will be used as teaching material for future courses.

References

- American Council for Construction Education (ACCE) (2009). [WWW document]. URL <http://acce-hq.org/documents/DOCUMENT103REVISIONDRAFT090909.pdf>
- Bureau of Labor Statistics (BLS 1) (2008). [WWW document]. URL <http://stats.bls.gov/news.release/pdf/cfoi.pdf>
- Bureau of Labor Statistics (BLS 2) (2008). [WWW document]. URL <http://www.bls.gov/news.release/pdf/osh2.pdf>
- Government Accounting Office (GAO) (1991). "Using Structured Interviewing Techniques," GAO/PEMD-10.1.5, Washington, D.C., June 1991, 191 pp.
- Occupational Safety and Health Administration (OSHA) (1996). [WWW document]. URL <http://www.osha.gov/doc/outreachtraining/htmlfiles/tools.html>
- Occupational Safety and Health Administration (OSHA) (2001). [WWW document]. URL <http://www.osha.gov/SLTC/etools/construction/index.html>
- Occupational Safety and Health Administration (OSHA) (n.d.). [WWW document]. URL http://www.osha.gov/pls/oshaweb/owasrch.search_form?p_doc_type=STANDARDS&p_toc_level=1&p_keyvalue=1926
- Taylor, J., Dossick, C., and Garvin, M. (2009). "Constructing Research with Case Studies," Building a Sustainable Future, *Proceedings of the 2009 Construction Research Congress*, pp. 1469–1478, Seattle, Washington.