



Construction Safety Training: Exploring Different Perspectives of Construction Managers and Workers

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Dr. Al-Bayati has more than ten years of experience in the construction industry working in diverse areas of the field, from safety coordinator to site engineer. He is a certified professional engineer (PE) in the state of Michigan, an OSHA-authorized trainer, an Associate DBIA™ certified and certified as a Construction Safety and Health Technician (CHST). Dr. Al-Bayati is one of the instructors at the Latino Workers Safety Center (LWSC) and is an instructor at the OSHA Training Institute Education Center.

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Abstract

The construction industry has high rates of fatal and non-fatal occupational injuries. The number of accidents in construction has been steadily increasing in recent years. Every year, more than 60 thousand construction fatalities happen in the world. In the United States, construction has the highest number of fatalities among all industries. In order to address high rates of accidents, researchers and professionals suggest providing safety training to construction workers. However, past research has demonstrated that existing safety training does not fulfill the requirements of a contemporary effective safety training program. In order to enhance safety training, it is essential to have an inclusive understanding of different perspectives of key players of construction projects: managers and workers. Therefore, the current study aims to investigate the perceptions, needs, and expectations concerning construction safety training from two different standpoints of managers and workers. To achieve the research objectives, 53 workers and 79 managers participated in the study. The results showed a significant difference between the workers' and managers' perceptions with respect to the effectiveness of provided safety training and needs for enhancement. Workers claimed that safety training that they received is not sufficiently effective and is not provided frequently. On the other hand, managers argued that safety training programs are valuable, but workers are not engaged in safety training programs and do not use the provided safety information in practice. However, the results of this research study demonstrated that the two perceptions can be reconciled by improving mutual understanding. In other words, the gap between these perceptions can be fulfilled by fostering effective communication among workers and managers concerning safety training. Construction professionals and practitioners can benefit from the findings of this study to facilitate effective communication between managers and workers in their construction projects to substantially improve provided safety training and achieve more desirable outcomes.

Keywords: Safety training, Construction safety, Construction managers, Construction workers

Introduction

Construction has high rates of fatal and non-fatal occupational injuries. The industry has adopted various means of safety measures in order to mitigate the abnormal safety risks of occupational hazards [1]. Research has shown that one of the most common practices to prevent accidents and mitigate the associated safety risk is providing safety training to construction workers. However, further research has revealed that among numerous levels and types of available safety training, most training programs offered by managers to workers fail to considerably improve the safety performance in construction projects [2], [3]. Apart from the basic safety training, provided safety programs are often found to become obsolete due to the continual introduction of the newest methods and resources for the construction activities. Moreover, the realistic practice of safety training is often compromised due to a variety of reasons such as project schedule and budget, high rate of production expectation, safety culture, negligence, reluctant enforcement, and lack of safety communication between managers and workforce [4].

In fact, the success of a safety training program requires coordination of two key players, managers and workers, and the alignment of their perceptions towards similar goals in implementing an effective safety training program. Not surprisingly, several researchers have shown significant discrepancies between the perception of safety among the construction stakeholders [5] – [8]. For example, Gilkey et al., found that managerial perception is more optimistic towards the safety atmosphere of their projects compared to the factual perception reported by the frontline workers [8]. Researchers argue that the discrepancies of stakeholders' safety perceptions are originated from different drivers that they have and potentially lead to compromised safety performance [9]. A recent study has shown that the workers' safety perception is predominantly derived from task-specific performances and their experiences. On the other hand, the safety managers acquire their safety knowledge and expertise mostly from the formal sources of training and education [5].

In order to implement an effective safety training program, it is crucial to explore the different perceptions of managers and workers and identify and address the discrepancies to find common ground to support safety training programs. The current study aims to investigate the needs and expectations with respect to construction safety training from two different standpoints of managers and workers. This article represents the first formal attempt to empirically investigate the two perceptions of workers concerning construction safety training. Construction professionals and practitioners can benefit from the findings of this study to facilitate effective communication between managers and workers in their construction projects to substantially improve provided safety training and achieve more desirable outcomes.

Methodology

Construction is one of the most fatal industries in the world. In order to prevent accidents and improve the safety performance of workers, construction professionals provide safety training programs. Successful implementation of an effective construction safety program requires cooperation, contribution, and involvement of different stakeholders to the programs [2], [3]. Although different perceptions are inherently common and inevitable, the difference in perceptions of a safety training intervention raises challenges and can considerably hinder the success of such interventions (i.e., safety training). Therefore, the purpose of this study is to (1) explore different perspectives of construction managers and workers with respect to safety training in their workplace and (2) study how these different perspectives can be reconciled to enhance safety training programs based on both stakeholders' needs and desires. It is good to note that this study does not aim to evaluate the effectiveness of provided safety training but subjective perspectives of workers and managers to spot dissimilarities to help them have a better understanding of other side's view concerning safety training.

To fulfill the research objectives, in Phase I, a comprehensive literature review was conducted by the researchers. A safety trainer authorized by Occupational Safety and Health Administration (OSHA) to provide safety training advised the researchers to design a survey and develop a set of complementary questions to evaluate the safety training perception of managers and workers. The questionnaire survey was developed based on two sets of questions customized for managers and workers, respectively. Both sets of questions were designed to provide managers and workers an opportunity to disclose (1) their own perspective towards safety training or (2) their evaluation of the counterpart's perspective (see Table 1). In Phase II, the questionnaire survey was evaluated by obtaining opinions of 20 construction experts. The construction experts validated the questions

asserting they fairly evaluate the perspectives of both sides (i.e., managers and workers) with respect to their perceptions of provided construction safety training.

In Phase III, to randomly select managers and workers for interviews, the researchers approached 29 active construction project job sites including residential, commercial, and infrastructure projects. The projects were mainly located in the South-East region of the US. Overall, 53 workers and 79 managers participated in the study. Managerial roles included ‘construction project manager,’ ‘assistant project manager,’ ‘design manager,’ ‘project engineer,’ ‘owner,’ ‘vice president,’ ‘supervisor,’ ‘superintendent,’ ‘site safety and health officer (SSHO),’ and ‘project safety coordinator.’ On the other hand, the workers’ specialty included ‘carpentry,’ ‘concrete,’ ‘demolition,’ ‘electrical,’ ‘equipment operation,’ ‘ironwork,’ ‘masonry,’ ‘mechanical,’ ‘plumbing,’ ‘roofing,’ and ‘general work.’

Table 1. Research Survey' Set of Complementary Questions

Questions	Managers	Workers
Q1	Q1a. Effective safety training programs have been provided to the construction workers.	Q1b. Effective safety training programs have been provided to me at the project.
Q2	Q2a. The construction workers attending safety training programs are engaged in the provided material.	Q2b. Attending the safety training programs, I was engaged in the provided material.
Q3	Q3a. The construction workers use the provided safety training material at daily work.	Q3b. I use the provided safety training material in my daily work.
Q4	Q4a. Regular safety [training] meetings are held on the job site.	Q4b. Regular safety [training] meetings are held on the job site where I work.
Q5	Q5a. I am open to safety feedback/requests from the construction workers.	Q5b. The managers/superintendents are open to my/other construction workers’ safety feedback/requests.

Both groups of participants covered a wide range of age and experience. Managers, on average, were 44 years old with 19 years of experience ranging from four months to 42 years. The workers’ age ranged from 18 to 58 and, on average, they had almost 12 years of experience working in the construction industry (see Table 2).

Table 2. The Participants' Demographic Information

	Managers		Workers	
	Average	Range	Average	Range
Age (years)	44.34	[21 – 64]	33.85	[18 – 58]
Construction Experience (years)	19.22	[0.33 – 42]	11.56	[0.5 – 40]

The interviews were conducted on-site, and the interviewees consented to voluntarily participate in the study which was previously reviewed and approved for exemption by IRB. The participants expressed their opinion in response to each question on a Likert Scale ranging between zero to 10, with zero and 10 indicating “Strongly Disagree” and “Strongly Agree,” respectively. Using 11-point Likert scales is recommended by many researchers to increase the generalizability of the results [10]. Moreover, 11-point Likert scales (from 0 to 10) is a natural and easily comprehensible range [11]. Researchers have demonstrated that 11-point Likert scale results in a smaller kurtosis and the distribution of the data is closest to normal compared to 5-point and 7-point Likert scales [12]. The researchers decided to only label the endpoints of the scales, “Strongly Disagree” for zero and “Strongly Agree” for 10. Inherently there is no significant difference in the results of endpoint-only and fully labeled scales [13]. However, labeling endpoints is less cognitively demanding and will help participants to easier hold in their memories [14], [15]. The data pertaining to the participants’ responses were gathered and integrated to be used for statistical analysis.

Moreover, at the end of each interview, the participants also answered the following question “Do you think these two different views [of workers and manager] are reconcilable to achieve a common ground and a mutual understanding?” Their responses were recorded as “Yes,” “No,” or “Maybe.” Some workers and managers gave further explanations to further articulate their views. The data were analyzed performing 2-sample tests using XLSTAT 2019. The results are presented and discussed in the following section.

Results

After conducting interviews, the obtained data were statistically analyzed. The data showed there are important gaps between the perspective of managers and workers on how they evaluate and perceive construction safety training practices (see Figure 1). Generally, the data showed that the managers were more optimistic about their performance in providing effective safety training on a regular basis and rated in favor of the questions related to their responsibilities (i.e., Q1, Q3, and Q5). However, the managers on average rated relatively low to the questions that demonstrated workers’ engagement in safety training and their safety performance (i.e., Q2 and Q3) compared to what workers reported.

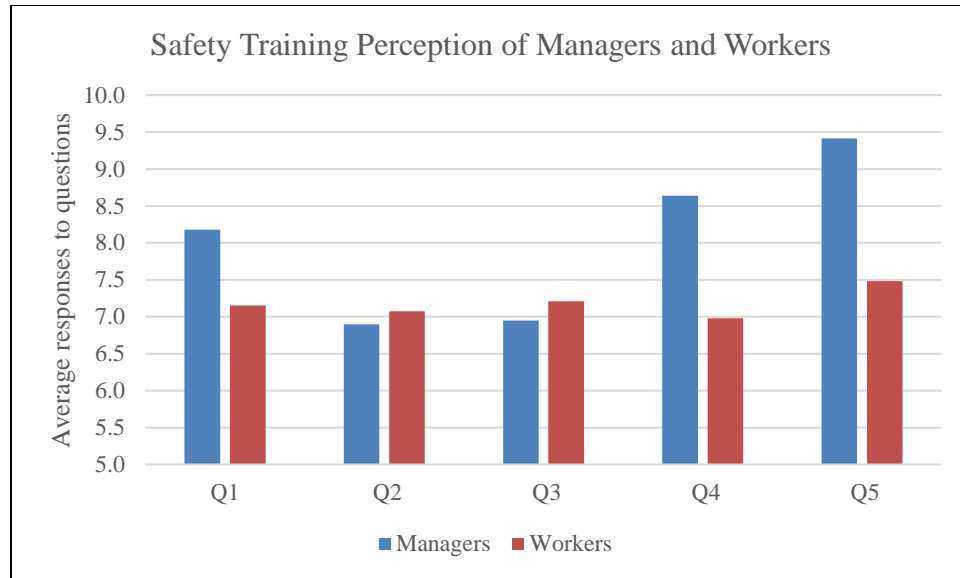


Figure 1. Safety Training Perception of Managers and Workers.

Although the difference in perceptions of managers and workers is revealed by the obtained data, further analyses were conducted to statically investigate the difference in the perceptions using 2-sample tests. The results of data analysis are presented in Table 3.

Table 3. Data Statistical Analysis Results

Questions	Difference	<i>p</i> -value	Statistical Difference
Q1	1.03 (14%)	0.008	Significant
Q2	0.18 (3%)	0.230	Non-significant
Q3	0.26 (4%)	0.251	Non-significant
Q4	1.66 (24%)	0.005	Significant
Q5	1.93 (26%)	< 0.0001	Significant

Statistical efforts revealed huge gaps between the perception of managers and workers with respect to construction safety training (p -value < 0.01). Managers believed that the provided safety training is effective (Q1a. Mean = 8.2 out of 10). Conversely, the workers expressed that, in their view, the safety training that they received to enhance their safety performance was less effective than what managers asserted (Q1b. Mean = 7.2 out of 10).

As shown in the table, the differences in the perception of (1) level of workers' engagement in the provided safety training, and (2) to what extent workers use the acquired knowledge in the field, were not statistically significant (p -value > 0.05). In other words, the analysis of data revealed an agreement between workers and managers in their response to two questions indicating that the provided safety training is relatively low engaging and there are some barriers that hinder workers to use the acquired knowledge in the field. Per previous studies, effective safety training programs are able to engage workers and also facilitate the transfer of knowledge from training sessions to field as key indicators of training effectiveness [2, 3]. Therefore, the data suggest that the

perception of workers in evaluating the effectiveness of the provided training is more realistic and the managers are biased in evaluating the safety training programs that they provide to workers. In other words, managers believe the provided safety training programs are effective and they fulfilled their duties, and these are the workers that must be blamed for not being actively engaged in training sessions and exercising the obtained knowledge in practice.

The review of the fourth question also reveals a discrepancy in evaluating the frequency of safety training meetings. Workers believe the safety meetings as part of on-site training are not held frequently (Q7b. Mean = 7.0 out of 10). On the contrary, managers claimed that safety meetings are provided on a regular basis to provide informative training to workers (Q4a. Mean = 8.6 out of 10). It can be interpreted from the data that there is a lack of proper communication between workers and managers exchanging safety training requirements, expectations, and desires.

Last but not least, managers consider themselves to be highly open to the workers' safety feedback and requests (Q5a. Mean = 9.4 out of 10). This result shows the managers' willingness to foster safety in their construction projects based on the workers' opinions. Although managers' mindset is remarkably promising to resolve discrepancies, the managers' desire has not been well communicated to workers (Q5b. Mean = 7.5 out of 10). In fact, workers are not aware of managers' attitudes and openness to the workers' safety training concerns, needs, and feedback.

Discussion

The results of the current study revealed various differences between managers and workers on their perception of safety training programs. In fact, the findings of this study suggest that the provided safety programs are not efficient to significantly improve the safety performance of workers and both managers and workers are aware of these weaknesses (Q2 and Q3). However, they identify different explanatory reasons to address the weakness of training programs. As mentioned previously, a post-hoc interview was conducted to find if the identified gap between the perception of managers and workers can be satisfied. The assuring outcomes show most participants (over 80%) believe managers and workers can find a common ground to reconcile and address the differences in their perception (see Figure 2).

Exploring workers' and managers' responses to the question provide insightful information that can shed light on the subject matter. They argued we (i.e., managers and workers) already have common ground. In response to the interview question an interviewee mentioned that "Yes, I believe that we already have an overall common ground, no one wants to get hurt or see someone else." A construction worker added that "I believe the manager[s] feel the same way about getting us home safely. Their business depends on it."

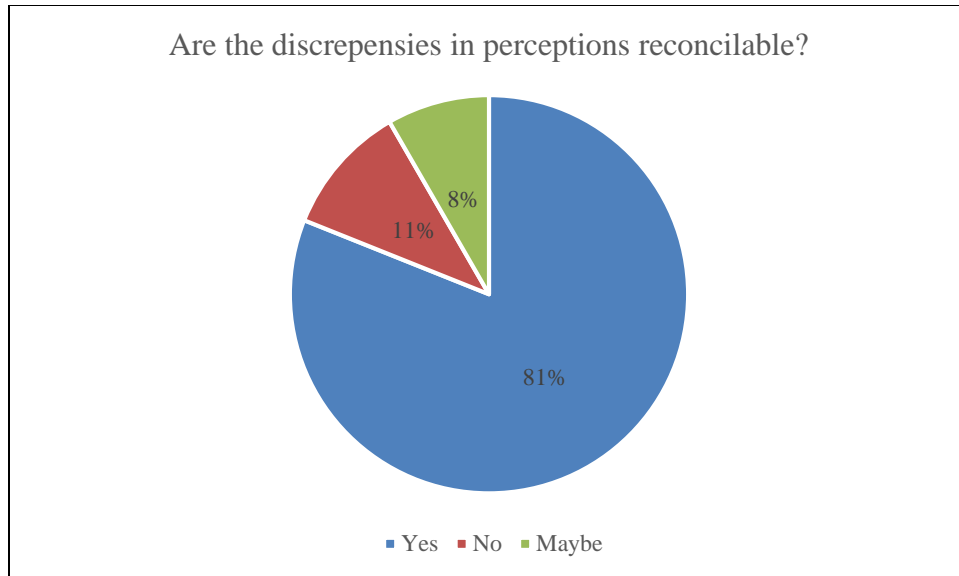


Figure 2. Post-hoc Interview Results

However, lack of proper communication is a significant barrier to build on this fundamental common ground [16]. Several managers and workers mentioned better communication is the key to address this shortcoming. Workers responses prove the importance of communication: *“Definitely, communications [are] most important in all phases of the construction industry;”* *“I do, it starts with better communication among workers;”* *“Yes, more communication on reasonable expectation;”* *“Yes, if managers and safety coordinators would buy into training workers to speak out on safety issues.”* Some workers assumed the managers responsible to improve communication; for example: *“Absolutely! If management can show they care and are diligent about driving safety, the workers will respond accordingly. Of course, this is incumbent on the manager implementing safety programs.”*

Some other workers add job-security as a barrier to proper communication as they explained: *“Yes, by giving job security and communicating with us better.”* Other workers, however, question if this gap can be filled due to lack of job security: *“Never have been, probably never will be - 2 different lungs on the social ladder- do what your told or will get someone who will!”* and *“No, because it is their way or the highway.”*

Apart from lack of communication, several workers debated that managers must have hands-on experience and be fully aware of their job site conditions: *“No, not if the manager doesn’t know what the conditions are on the job site;”* *“Yes, showing empathy goes a long way, also, if managers were more hands-on, they would have a better understanding of reality.”*

On the other hand, the managers also argued that primary communication must be improved to enhance safety. For example, a manager mentioned that *“I do, communicating overall goal is key.”* A manager referred to a lack of trust among workers to their managers as an eminent barrier: *“I believe it can be as long as the workers trust their manager.”* Another manager claimed that it requires the collaboration of all stakeholders to solve the problem: *“I think we can reach a mutual*

understanding but there will always be a divide. From my experience there persists an 'us vs. them' mentality. To change there has to be a true mind shift in the way employers and employees think. Employees need a buy-in from management that performing safely will bear a reward; this is a balanced activity which if left improperly managed can create an inefficient workplace." In addition, an interviewed manager expressed the frustration to properly guide workers to follow safety practices: *"No, workers will always kick back against management safety requirements in order to get stuff done."*

A participant from the group of managers indicated that the solution can be reached only if fundamental changes are made to companies: *"Yes, but that will take a different structure that currently in place at most companies."* Some experienced managers see the solution in the consistency and providing comprehensive safety training to everyone on the job site: *"It's a constant battle to get [workers] to abide by safety rules. As a general note often the GC spends money on training for safety but has no required safety training for subcontractors in their related trades, what happens is the GC superintendent is expected to provide safety to a bunch of employees of subcontractors who are neither trained for safety or care about it;"* *"Yes, I think so, but when the same standard isn't set for everyone, there is always going to be some kind of issue."*

Conclusion

The construction industry is the most fatal in the US and one of the most hazardous industries in the world. The number of accidents in construction has been steadily increasing. Every year, more than 60 thousand construction fatalities happen in the world [17]. In order to address high rates of accidents, safety management programs provide safety training to construction workers to improve their performance. However, according to past research, most provided safety training programs fail to substantially improve the safety performance of construction workers [2]. In order to enhance safety training, it is essential to have an inclusive understanding of different perspectives of key players of construction projects: managers and workers. In fact, the perception of each side is a subjective evaluation of safety training programs based on the role, rank, and the corresponding needs and desired. Therefore, the current study aims to investigate the needs and expectations concerning construction safety training from two different standpoints of managers and workers as the first formal attempt to empirically study the subject matter. To achieve the research objectives, researchers developed a research survey, based on a comprehensive literature review and subsequently validated the survey by a group of 20 construction experts. Then, currently-employed managers and workers in the US were randomly approached to participate in the study. Overall, 53 workers and 79 managers from 29 active construction projects participated in the study.

The results reveal crucial discrepancies between the workers' and managers' perceptions with respect to the effectiveness of traditional safety training and needs for enhancement. Managers believed the provided safety training is effective, but workers are not engaged and do not use their knowledge in practice. On the other hand, workers declared that the provided safety training is not effective and their level of engagement in training programs is relatively low. There is an agreement between workers and managers that there are existing barriers to the transfer of knowledge to workplaces. Moreover, managers expressed that they provided safety training and meetings regularly but, on the contrary, workers reasoned that there must be more safety training meetings. Finally, managers explicitly claimed that they are open to receive safety feedback from

their workers. Nevertheless, workers have not received this message from managers that they accept their vulnerability and welcome safety concerns from workers.

A post-hoc question demonstrated that there is a high level of agreement between workers and managers, common ground can be found, and this gap can be satisfied. In fact, the participants indicated that there is already common ground mainly based on the wisdom that “no one wants to get hurt or see someone else.” Managers and workers identified the lack of proper communication as the main barrier to address these discrepancies. In other words, fostering communication is the key to overcome existing differences concerning construction safety training. Learning dissimilarities in the perception of safety training effectiveness can help managers and workers to have a better and more realistic understanding of another side’s view concerning safety training. Construction professionals and practitioners can benefit from the findings of this study to facilitate effective communication between managers and workers in their construction projects to substantially improve provided safety training and achieve more desirable outcomes.

The article is part of on-going research studies to foster safety training enhancement. In particular, this study shows the existence of dissimilarities in the evaluation of safety training subjective to managers and workers and spots the key challenging differences. Also, this article suggests that the enhancement of communication between managers and workers is the key to reconcile the differences. Further studies must be conducted to specifically find how communication among both key stakeholders (i.e., managers and workers) with respect to safety training can be improved to ultimately customize safety training programs to enhance construction safety performance.

Acknowledgments

The authors would like to express their sincere appreciation to all construction experts, managers, and workers who assisted and/or participated in this research study. This study would have not been accomplished without their help and participation.

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