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Psychological Influence on Safety Culture in the Construction Industry: A Pedagogical Framework for Safety Training Application

Amelia D. Saul¹, Syed M. Ahmed¹, and Mostafa Namian¹
East Carolina University, Greenville, North Carolina
saula12@students.ecu.edu, ahmeds@ecu.edu

Abstract

Construction and engineering careers place an emphasis on safety training. Although this knowledge is crucial to succeeding in one's field there is a lack of awareness with regards to the principle of safety culture. Within a psychological context, workers in a particular setting look towards others for social cues, and there are underlying social principles that determine whether social cues will be internalized, acted on, or ignored. Therefore, the purpose of this paper is to provide an approach to advise trainers on underlying safety principles. The goal is for learners to internalize and act upon safe behaviors in the work environment. A pilot study was conducted interviewing four OSHA-authorized construction safety trainers. The participants were provided with a vignette activity and asked their opinion and experience. After the activity was complete, the participants rated their experience and provided suggestions for improvements. The vignettes were highly rated by the trainers and they suggested including additional vignettes, having the activity applied in various versions (group vs individual) as well as doing an at-home activity. Future research will work on improving safety behavior to be included in additional safety training.

Key Words: Construction Safety, Safety Culture, Social Atmosphere, Safety Education, Pedagogical Construction Education

1 Introduction

Safety training is a critical aspect of the construction industry. Although there is a trend of decreasing deaths in the American workplace, there were still 991 deaths in the construction industry in 2016 (OSHA, 2018). This indicates construction-related deaths and injuries are still prevalent, and safety-related training and practices need to be explored through renewed perspectives.

In the interest of improved safety and to further decreased accidents and injuries, it is appropriate to explore human factors associated with safety and integrating social sciences into curriculum and practice. Over the past decade, there has been a trend towards increased awareness of safety culture and climate and how these concepts relate to the overall safety of an organization, workgroup, and individual. This paper aims to explore dimensions of occupational health psychology and social psychology that may be underlying motives of a positive, or negative safety climate, and suggest how to add certain concepts into current safety culture training.

2 Literature Review

2.1 Safety Culture

Many definitions of safety culture have evolved over the past decades, and this concept has been explored quite in-depth. Additionally, most definitions include values, attitudes, and beliefs, and targeting these specific patterns of behaviors has been correlated with safety improvements in the work environment (Glendon & Stanton, 2000). Therefore, targeting the construction industry, it may be beneficial to briefly explore values, attitudes, and beliefs through a social psychology perspective that can be a proactive method to combatting a negative safety culture.

According to the National Institute for Occupational Safety and Health (NIOSH) Safety Culture and Climate in Construction Workshop Report, safety culture in this context is defined as, “Deeply held but often unspoken safety-related beliefs, attitudes, and values that interact with an organization’s systems, practices, people, and leadership to establish norms about how things are done in the organization. Safety culture is a subset of, and clearly influenced by, organizational culture” (Gillen, Goldenhar, Hecker, & Schneider, 2014).

Within an organization, there is also a safety climate that reflects upon this concept. According to Gillen et al. (2014), “Homogeneous subgroups tend to develop shared perceptions while between-group differences are not uncommon within an organization.” There is an overwhelming amount of support that correlates safety culture and climate to safety behaviors and company workplace safety, (Fang & Wu, 2013; Molenaar, Park, & Washington, 2009; Nordlof, Wiitavaara, Winblad, Wijk, & Westerling, 2015; Zohar, 2000).

2.2 Social Atmosphere

Beliefs, norms, attitudes, roles, and social practices are crucial components of defining safety culture (Chen, McCabe, & Hyatt, 2017; Turner, Pidgeon, Blockley, & Toft, 1989). All of these terms are directly related to social psychology and the atmosphere created at each individual organization and job site. From a psychological perspective, social atmosphere refers to a social climate or social environment. Social atmosphere is the “general tenor or inclination of any society, or segment thereof, that has effects on the attitudes of individual members” (Reber, Allen, & Reber, 2009). The attitudes held by individuals within a larger group or social structure are constantly influenced by those in their immediate surroundings. Extending this to safety in the workplace, construction workers are constantly being bombarded with other people’s safety attitudes, and those attitudes can affect their own perceptions.

2.3 Social (Subjective) Norms

A product of a social atmosphere is subjective, or social, norms. These norms are indicators of intentions, or how someone believes others think they should act in a given situation (Ajzen & Fishbein, 1972; Conner & Armitage, 2006). These norms are what is considered normal within a

specific group or setting and act as a catalyst for determining intentions of behavior. Significant others (i.e., peers, coworkers, colleagues) impact one's own behavior more than may be realized (Connor & Armitage, 2006). Connecting this to the safety climate of a work area, these norms can either be negative or positive. Positive norms would be behaviors that increase safety, while negative norms are behaviors that would decrease safety or promote unsafe habits. These social norms are crucial to workgroup climate, and entire items have been created in the realm of psychology for measuring workplace climate based on social norms (Walsh, Magley, Reeves, Davies-shrills, Marmet, & Gallus, 2011).

2.4 Attitudes

Another component of subjective norms is attitudes. The transition from norms to attitudes occurs when someone internalizes the norms of a given situation. A person's attitude toward a behavior relies on their beliefs about the consequences of the behavior, or how those significant others around them will react to their behavior (Ajzen & Fishbein, 1972). According to the Theory of Planned Behavior, the mind, perceptions, and beliefs are key indicators influencing safety behavior (Schifter & Ajzen, 1985). Therefore, attitudes and subjective norms have been used to successfully predict safety-related behavior (Xu, et al., 2018). Furthermore, there is new evidence in the construction literature indicating that these underlying affective components are not targeted or changed from current designs of safety training (Loosemore & Malouf, 2019). In a study by Loosemore and Malouf (2019), mandatory safety courses were discovered as *ineffective* in targeting affective and emotional aspects of safety. Therefore, although workers are learning safety knowledge, they are not internalizing, nor caring more, about safety values. Instead, the authors suggest an approach outside the already defined class materials to target this unadjusted affective component of safety.

Additionally, these attitudes are malleable and can be changed (Cox & Cox, 1991). Different methods have been utilized to attempt to decrease unsafe norms and attitudes, and a common approach is to provide incentives and feedback in order to reinforce constructive beliefs and extinguish negative beliefs (Cox & Cox, 1991; Molenaar, et al., 2009). Through educating on these implicit processes, we may be able to combat unconstructive and negative safety beliefs in construction.

3 Methodology: Proposed Pedagogical Framework

Through the review of literature, it is evident that targeting changes in behaviors, attitudes, and norms is a successful technique for improving organization safety, climate, and culture. It would be beneficial to make students aware of these concepts and how to willingly apply them in real scenarios. An individual commitment to hazards and error prevention is necessary for a positive safety culture. People that are highly committed tend to be thoughtful and cautious (Marquardt, Gades, & Robelski, 2012). Based on the concepts of behavior, norms, and attitudes, a recommended short module on combating negative safety behaviors is provided.

This design is supported by construction safety research regarding hazard recognition on job sites and findings that reveal this recognition is impacted by safety training methods (Namian, Albert, Zuluaga, & Behm, 2016). Albert and Hallowell (2017) discovered that safety hazards are recognized better when workers communicate with each other, rather than hearing it from their supervisors. This supports a safety training module focused on improving the social atmosphere and norms within workgroups to achieve thoughtfulness, cautiousness, and attitudinal change.

3.1 Classroom Materials

Terms: Relevant social psychology terms are briefly described to students and their relevance to safety culture is also explained. The terms include social atmosphere (climate/environment), social norms, and attitudes.

Figures: A figure is provided as a diagram outlining the social psychological processes leading to a negative or positive safety culture. A basic and universal construction safety behavior, not wearing a safety helmet when it is necessary for the job, is used as an example to illustrate how an individual can either help or hinder a positive safety culture. Instructors can create a diagram or illustration, such as the example below created by the authors, to reveal a real-life workplace safety violation.

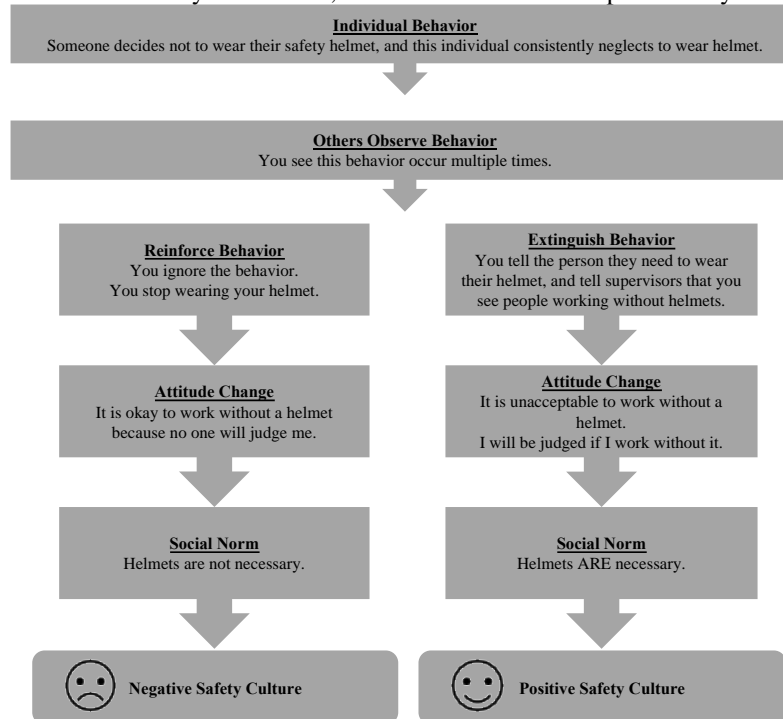


Figure 1: Diagram of Reinforcing Negative or Positive Safety Culture

3.2 Class Activity: Critical Thinking Vignettes

As previously stated, safety ideals can be molded through changing one's beliefs. One possible way to challenge difficult barriers and adopt constructive schemas is through applying the concepts to a mindset activity in class. In order to solidify these concepts, case studies focusing on social norms in a construction setting can be used. First, the students read a vignette of a real-life scenario and are asked to critically analyze the situation to determine if there are positive or negative norms being perpetuated at the job site. *It is crucial for the scenario to include a distinct social atmosphere, safety norm, and an action or inaction being performed by the protagonist in response to the norm.*

An example of such a vignette is: "There is a large job site working to build a new apartment complex in the metropolitan area. Your subcontracting team works closely along with another team that you have not encountered before. You start talking to one of the other team members, Fred, and become friends with him. One day, you see one of Fred's coworkers using a scaffold as a ladder, and you find this behavior odd. Later in the week, you observe Fred engaging in the same behavior, as well as other coworkers. You ask him why he uses a scaffold as a ladder, and Fred replies that it's a

good way to save some time and effort. Since you are now good friends with him, you shrug off the odd behavior.”

Each student should individually read the vignettes, analyze the situation, and write down their initial thoughts, feelings, and reactions to the scenarios. After considering the situations alone, students’ partner-up in small groups, and are provided critical thinking questions to discuss and answer collectively for each vignette. These questions were created by the authors and are based on techniques to internalize attitude and behavioral change.

Questions	
1	Can you identify the social atmosphere in this scenario?
2	Is there a safety norm occurring? If so, what is the norm? Is it positive or negative?
3	Did the observer (you) in the scenario go with the norm or against the norm?
4	Did your reaction to the norm reinforce the behavior?
5	What barriers were present that prevented or caused hesitation in speaking up?
6	Should you have responded differently? If yes, what steps would you take to ensure you speak up and are heard?
7	If a negative norm is present, what is a potential safety outcome that could occur if the behavior continues?

Table 1: *Questions Answered After Vignette:*

After providing an adequate amount of time for students to discuss these questions in small groups, have the class conduct an open discussion and debate different perspectives of the scenarios. Acting as a discussion facilitator, the professor can help students develop critical thinking skills to recognize and act against negative safety norms and endorse positive safety norms. The goal of this activity is to connect the material to real-life scenarios and provide routes towards enhancing and promoting a healthy safety atmosphere.

4 Results

A pilot study was conducted using the vignettes discussed above to explore the importance and effectiveness of integrating psychological aspects to safety training. All four participants were OSHA-authorized construction safety trainers with a few months to 20 years as an authorized trainer. Four participants were given surveys and a proposed module. The participants were asked to answer questions based on their safety training related experience. The participants’ age ranged from 34 to 57 years old and their experience ranged from 5 to more than 20 years.

The primary results showed that half of the participants had never considered psychological aspects of safety training in their training programs (i.e., OSHA 30 and OSHA 10). The other half have considered the psychological aspects. One of the participants stated that he/she “Included it in accident causation discussions, requisite activities for building a successful safety program, and analyses of various safety cultures demonstrated by upper management communications. All related to OSHA 30 training.” The other participant who had considered psychological aspects uses it to engage with students in order to increase their attention and active participation.

One of the participants (Participant A) believes that it is important that the trainees learn and integrate principles of human safety behaviors, but the level of importance depends on what the trainee will be doing. If the trainee is in a supervisor role then it is more important than if the trainee is doing fieldwork. Participant B believes that it is extremely important but did not go into more detail. Participant C stated that it is critical to learn principles of human safety behavior because it can have an impact on their workplace if they do not have that knowledge. Managers and leaders who

know proper safety behaviors can help to prevent construction accidents. Participant D believes that it is very important but did not go into more detail.

With respect to considering an outlined safety topic on human safety behavior in safety training programs, Participant A indicated that it depends on the level of training that the participant is receiving. If the participant is only receiving the OSHA 10 training, then it may be less necessary than if the participant is receiving the OSHA 30 training. Participant B and C agree that there should be an outlined safety topic on human safety behavior and Participant D stated “maybe”.

The majority of participants did not have a story to share with their trainees to demonstrate the importance of psychological influence on safety behavior. Participant C stated that they have noticed that the norms are stronger than laws in enforcing safety. In fact, in some cases, seeking safety practices is seen as a negative by others. The person being safe is seen as being weak, lacking experience and having low self-confidence. Therefore, the workers may develop negative habits of not using PPE and not practicing safety rules. These unsafe behaviors and negative safety culture require considering underlying human behavior principles from a psychological perspective.

The participants stated many different elements of human safety behaviors that should be considered as topics for training including: reinforcement and reward systems; assessing the safety culture of the workplace; strategies to positively impact safety culture; attitudes; habits, social norms and peer pressure; and the safety partnership between management and employees.

After completing the activity, the trainers were asked to evaluate the proposed framework based on their professional experience. All of the participants rated their experience using a 7-point Likert scale. Participant B stated that they believe behavioral changes are the most important aspect of safety on job sites because they help to keep the job site incident and accident-free. Participants were also asked how they would recommend including this activity in their safety training. Participant A did not answer. Participant B stated that they would ask the trainees to complete a homework assignment where they find a job site nearby and observe the workers by tallying the number of human behavior errors that occur and discuss how they would react to them. Participant C suggested getting the trainees to talk to safety managers and to find one to be a guest lecturer for a presentation. They also suggested asking the trainees to talk about their previous experiences when they have done something unsafe on the job site. Participant D suggested performing this scenario as a class, in groups, and individually to drive home the point of the activity.

5 Conclusion and Future Research

Safety culture is a topic well-explored within organizational psychology, and over the past decade, it has become a crucial component of construction safety. Although it has been analyzed in-depth, its psychological roots have only been explored rather than elementary. There is growing research that supports there is a significant social psychology aspect to the safety climate of a workgroup at any given time and educating on these topics may help expand the scope of knowledge and aid preventative measures. Two authors of this paper indicate that as OSHA-certified trainers, the material included in this module provides a new perspective that is desperately needed in the construction industry. Many accidents continue to occur, and it all revolves around workers not caring about the safety materials they learn. Through this additive, pedagogical module, underlying attitudes can be targeted and improved to create more safe work environments.

The social atmosphere, the norms it harbors, and individuals' attitudes towards those norms are crucial factors that predict whether a negative or positive safety culture is perpetuated. Therefore, educating students on the basics of certain underlying social aspects may help increase awareness of techniques to increase a positive safety culture. A short pedagogical module design of defining terms and relating them to safety culture, providing a diagram that shows the correlation with a simple

example, and a critical thinking activity, using vignettes of real scenarios, helps students connect the material to the real world and analyze situations where positive or negative safety norms are presented. This method is suggested as an addition to current safety educational programs.

Suggestions for the future include creating a research design to test the effectiveness of this method. An experimental design for testing the effectiveness of the classroom module and activities includes two sections of an undergraduate level construction management class taught by the same professor, and the difference between the experimental and control conditions is one class receives the additive module. In order to measure the effectiveness of the module, each class completes a short inventory before taking the module and after completing the module. Social norms and normative influence inventories are prevalent in the existing literature and can be used to measure if the social norm activities impacted how likely these individuals are to conform to social norms around them. Although scales already exist (Bernberg, 1955; Goldsmith, Clark, & Lafferty, 2005; Moore, 1964), one could adapt an existing scale to include a focus on construction-norm influence and conformity. After administering the inventory before and after completion of the module to experimental and control conditions, the data can be analyzed to determine if the change in the mean score of the experimental class differed significantly from the change in the mean score of the control class.

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