



# Safety culture among Chinese undergraduates: A survey at a university

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## ABSTRACT

A growing number of accidents at universities have caused public concerns in China. Improving safety culture is perceived to be an effective way of preventing accidents in many industries. Both study on safety culture among Chinese undergraduate students and research on injury prevention strategies for undergraduates are quite limited. To understand the safety culture of Chinese undergraduates, a survey using self-administrated safety culture questionnaire was conducted. 362 undergraduates at a university in Beijing responded to the questionnaire anonymously. A description on the safety culture among undergraduates at this university was provided. It was found that female undergraduates have better safety culture than male undergraduates, and safety culture of undergraduates majoring in occupational health and safety (OHS) was better than that of students in other majors. However, there was no significant difference of safety culture found among students in different academic years. The results highlighted the need to pay more attention to male students in accident prevention programs and to develop strategies to improve safety culture with the academic year increasing. In addition, safety mandatory and elective courses were recommended for all undergraduates to promote their safety culture.

## 1. Introduction

Undergraduates' safety in China needs to be improved because of high frequency of severe accidents occurrence at universities. For example, 4 undergraduates lost their lives and 5 undergraduates were injured on their tourism journey because of a traffic accident on the last day of 2017 (People.cn, 2018). 4 undergraduate students were killed in a fire caused by electrical equipment in 2008 (Yang, 2013). There is an urgent requirement to make university be a safe place to study.

Over the past few years, the role that safety culture (or safety climate) plays in shaping safe environments has been increasingly recognized by organizations in high-risk industries. Many high reliability industries around the world has been showing an interest in the concept of 'safety culture', as a way of reducing the potential for large-scale disasters (Gordon et al., 2007). Wu et al. (2007) argue that an organization can construct a positive safety climate and then exhibit an outstanding safety performance by creating a proactive safety culture. The current attractiveness of safety culture is linked to the belief that the assessment of safety culture may provide a leading indicator of the level of safety that exists in an organization and may be used to benchmark organizational safety performance (Mengolini and Debarberis, 2007). Accidents at universities are closely related to safety behavior, safety attitude and safety awareness of undergraduates, which are the main aspects of organizational safety culture. Perrin et al. (2018) also point out that a general consensus exists about the necessity to promote a

substantial increase of the relevant safety culture at university. Therefore, it is proposed that understanding safety culture and taking measures to improve safety culture is a pertinent way to prevent accidents at university.

Research on undergraduates' safety culture in China is limited. There is only research on perceptions of patient safety culture among medical students in China (Liu et al., 2018). There are relevant research in other countries. Occupational accident among employees in Andalusian (Spain) public universities, which comprise of lecturers, researchers, and administrative and services personnel rather than students, is studied by Suárez-Cebador et al. (2015). Safety climate of employees in university and college laboratories is analyzed by Wu et al. (2007), and this research points out that accident experience and safety training affect the climate with practical significance. However, there are differences between safety culture of employees and that of undergraduates because of their background and different work content.

Faller et al. (2010) carry out research on accidents involving university students in Westphalia (Germany), assess the general prevalence of accidents among university students and suggest doing further studies on the causes of the accidents. Assessments on college students' safety beliefs, safety values, and safe behaviors, which are the main content of safety culture, are conducted among by Blair et al. (2004) and Crowe (1995). And, time trends and predictive factors relating to safety skills, confidence, and attitudes are analyzed in an Australian

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university to target strategies to reduce the excess injury rate for young workers (Thamrin et al., 2010). However, the situation of Chinese undergraduates is quite different from those of undergraduates in other countries. In China, all undergraduates live and study on campus. Students' activities include studying, having meals in dining room, staying in dormitories, doing sports on the playground or in the Gym. Fires and electricity shocks are of high frequencies in Chinese universities. By contrast, students enrolled in Blair et al. (2004) and Crowe (1995)'s research live outside the campus and motor-vehicle crashes account for most of all the unintentional injury deaths. And Thamrin et al.'s study is aimed at strategies to reduce the excess injury rate for young workers, because there are many students working part time off campus (Thamrin et al., 2010). However, there are very few Chinese undergraduates work part time outside of the campus. Employment for teenagers is unusual and not quite supported by Chinese parents. Therefore, results of research on injury preventions in these developed countries might not apply to China. There is a study which investigated the state of chemical laboratory safety awareness, attitude and practices among tertiary students in Trinidad and Tobago, a developing country with a system that is very similar to that of the Chinese system (Walters et al., 2017). However, students' perception of safety culture on other aspects other than chemical laboratory at universities are not included in this study. Therefore, it is necessary to have an additional understanding of the safety culture of Chinese undergraduates and to find out the characteristics of their safety culture.

This paper aims to provide an understanding of safety culture (mainly safe behaviors, safety attitude and awareness) among Chinese undergraduates at a university, especially the weaknesses, and find out the differences of safety culture among different groups. Based on this study, intervention strategies to prevent accident among undergraduates could be developed.

## 2. Method

### 2.1. Instrument

Safety culture (or safety climate) in workplace has traditionally been measured using questionnaire surveys. And, there are numerous studies on the best attributes for measuring safety culture (Mariscal et al., 2012). Some examples of these questionnaires are shown in Table 1. These safety culture (or climate) assessment instruments were developed based on previous questionnaires and were tested for effectiveness in their specific research. Therefore, a specific tool for safety culture assessment among Chinese undergraduate students was developed in this study. And, the previous questionnaires can be used as good references in terms of both their safety culture domains and the questionnaire structures.

In the process of developing the safety culture questionnaire for this research, the dimensions of safety culture among undergraduates was studied. The most widely accepted definition of safety culture comes from the nuclear power industry. Safety culture has been defined by ACSNI (The Advisory Committee on the Safety of Nuclear Installations)

as: 'the product of individual and group values, attitudes and beliefs, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization's health and safety management' (ACSNI, 1993, p. 23). The dimensions of safety culture are fully discussed in many other papers (Cox and Cox, 1991; Cooper, 2000; Guldenmund, 2000; Glendon and Stanton, 2000; Parker et al., 2006). In the above previous studies on the dimensions of safety culture, safety attitude, safety awareness and safe behaviors are mostly included in safety culture in various industries. In a report on creating safety culture in academic institutions, the safety culture of an institution is defined as a reflection of the actions, attitudes, and behaviors of its members concerning safety—these members include the managers, supervisors, and employees in the industrial and governmental communities; and the administration, faculty, staff, and students in the academic community (ACS (American Chemical Society), 2012). Although the focus of this document is on departments offering chemistry, this report indicate that the safety culture dimensions in academic community are similar to those of other organizations. Therefore, students' safety attitude, safety awareness and safe behaviors were suggested to be the main content of safety culture among undergraduates in this research, just as in other industries.

Questionnaire items falling into the above three dimensions were developed by means of Delphi expert consensus approach. Full time professors, associate professors, lectures or researchers who do research in OHS departments at universities and are familiar with research in safety culture area were invited to participate in the development of the questionnaires items. After 2 rounds of expert consultation, 29 items were obtained, which included students' safety attitude, safety awareness and safe behavior in dormitories, labs, classrooms, and outside of buildings, etc. Among these 29 items, 16 items were related to undergraduates' safety attitude and safety awareness; other 13 items were related to undergraduates' safety behavior (see Table 3).

Undergraduate safety culture was demonstrated by mean scores of questionnaire items. A five-point Likert scale (1-Disagree, 2-Rarely agree, 3-Somewhat agree, 4-Moderately agree, 5-Totally agree) was used to quantify the measurement of each item. This research used SPSS for data analysis. ANOVA were used to test the effects of gender, major and academic year on safety culture of undergraduates.

### 2.2. Subjects

370 copies of questionnaire were allocated to undergraduates of different academic years and various majors in China University of Petroleum in Beijing during the spring semester of 2015. To get truthful responses, the questionnaires were anonymous. Since the questionnaires were handed out by instructors during class, all the questionnaires were received. However, during the data analysis we removed eight questionnaires because they were incomplete. So, we got 362 valid questionnaires with an effective response rate of 97.8%.

Table 2 showed the numbers of respondents of different genders, academic years and majors. The number of male and female students who responded to the questionnaire was almost the same. Respondents

**Table 1**  
Some examples of safety culture measurement questionnaires.

Studies	Industry	Measuring content	Number of items
Lee and Harrison (2000)	Nuclear power stations	Safety culture	120
Mariscal et al. (2012)	Nuclear plant	Safety culture	28
Fu et al. (2009) and He et al. (2012)	Not specified	Safety culture	32
Lin et al. (2008)	Not specified	Safety culture	21
Kwon and Kim (2013)	Manufacturing	Safety climate	21
Blair et al. (2004) and Crowe (1995)	College students	Safety beliefs and safe behavior (practices)	33
Aumann et al. (2007) and Thamrin et al. (2010)	Incoming university students	Safety perceptions	2
Walters et al. (2017)	Tertiary students	Chemical laboratory safety awareness, attitudes and practices	20
Liu et al. (2018)	Medical students	Perceptions of patient safety culture	26

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