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The influence of learning-oriented leadership for promoting future-directed workplace safety in the mining industry

Abstract
Learning-oriented behaviour is important for risk identification and safety management, especially in high-risk industries. Yet, its effect in relation to employee safety citizenship behaviour (SCB) has not been systematically investigated. This study aims at: (a) examining the impact of safety learning behaviour on SCB; (b) examining the relationship between job risk assessment, safety training and safety learning; and (c) examining the mediating effect of safety learning on the relationship between job risk assessment, safety training and SCB. Data were collected from a sample of 316 employees of six large-scale gold mining companies in Ghana, and analysed using the partial least squares-structural equation analysis. The results showed a positive significant association between safety learning and employee-safety voice and safety stewardship behaviours. Job risk assessment, safety training and safety learning were also associated positively with each other. The result showed further that safety learning mediates the relationship between safety training and employee safety voice and safety stewardship behaviours. Our findings provide implications for theory and practice as it points out the critical influence of learning-oriented supervisors behaviour for promoting future-directed workplace safety.

Keywords: safety citizenship behaviour, job risk assessment, safety training, safety learning, mining

1. Introduction

The mining industry has always been posing a challenge for employees, environment and host communities. Due to its complex nature, it has led to the adoption of technology, use of sophisticated equipment (Carter, 2016) and safety standards to stem the danger and hazards employees are exposed to. Still, existing studies continue to describe mining as a high-risk industry due to the recurring cases of work-related incidents (Elgstrand et al., 2017; Komljenovic, Loiselle, & Kumral, 2017). Work-related incidents in mining are largely attributed to unsafe work behaviour and hazardous conditions of the occupation. For example, Verma and Chaudhari (2017) suggested that about 90% of mining incidents were due to unsafe work behaviour of employees. Stemn (2018) found that between 85% and 90% of non-fatal and fatal incidents emanated from mining equipment. From these, clearly, a more integrated and innovative behavioural approach which examines the interplay of human factors and safety systems is important in addressing safety in the mining industry. In a recent review study, the causes of unsafe work behaviour of employees in the 21st century workplace was investigated by Dodoo and Al-Samarraie (2019). Their findings point out the influence of an array of human factors on incident generation for varied job contexts. Specific to the mining industry, factors such as inadequate safety training, stress, long working hours, work pressure, poor supervision, and poor working conditions were identified as the main contributors to workplace incidents. To ensure safety and prevent mine-related incidents in today's workplace, safety citizenship behaviour (SCB) must be considered in the formation of any safety management system.

Developing employee SCB appears to be emerging in safety research. SCB is particularly relevant for risk management in safety-critical industries (Reader, Mearns, Lopes, & Kuha, 2017), where productivity and organisational performance are closely tied to safe work operations. According to Turner, Chmiel, and Walls (2005), the level of risks and hazards associated with high risk industries enable employees to easily build personal commitment towards SCB. The literature describes SCB as employee-initiated contributions that are not contractually rewarded, go beyond formal accountable roles to prevent accidents, injuries and fatalities and promote future organisational safety (Curcuruto & Griffin, 2018). SCB is considered important for capacity development and critical for initiatives that promote change and innovation (Griffin & Curcuruto, 2016). It increases employee commitment significantly, leading to retention and customer satisfaction (Turner, 2017). Although the positive role of SCB has been established in the literature, less is known about specific work-context and organisational antecedents that promote SCB among employees.

Earlier research on SCB demonstrates that leadership was a key driver for promoting safety behaviour among employees. Empirical studies show that organisations that clearly demonstrate leadership support are likely to achieve significant employee-initiated actions that support safety management. Founded on the organisational citizenship behaviour philosophy, Hofmann, Morgeson, and Gerras (2003) identified quality leader-member-exchange relationship as an important component for SCB. Motivated by this, Reader et al. (2017) in their study argued that organisational initiatives that support the health of employees can potentially promote SCB. Their study reported that perceived organisational support can serve as the main antecedent of SCB. Curcuruto and Griffin (2018) examined organisational support for safety participation and team safety climate as antecedents and psychological ownership and affective commitment as mediators of SCB. Dodoo, Surienty, and Zahidah (2021) identified hardiness disposition and psychological safety as significant antecedents of SCB. The authors refered to SCB as a multidimensional construct, with change-oriented and affiliative-oriented as part of its structure.

Although, these studies serve as important building blocks for the SCB concept, they are not exhaustive. This is because the roles of specific leadership behaviours are yet to be investigated, leading to a gap in knowledge regarding their roles in high-risk industries. According to Griffin and Hu (2013), exploring the interrelationships between specific leadership behaviours may potentially lead to the discovery of distinct behaviours that can support organisational safety. Moreover, less attention has been paid to understanding the interplay between critical work-context factors and SCB relationship. In addition, the literature suggests that the mining industry relies on job risk assessment (Cui, Fan, Fu, & Zhu, 2013; Parker, Tones, & Ritchie, 2017) and safety training as key management practices to modify behaviour among employees and to prevent incidents in mining (Vignoli, Mariani, Guglielmi, & Violante, 2017). Frese and Keith (2015) in their review described job risk assessment and safety training as an active approach to minimise the negative impact of errors and enhance learning and innovation in the workplace. Consequently, the authors called for future research to consider the role of certain mediators of the relationships between error management factors and innovation. Although, the positive roles of job risk assessment and safety training have been established in the literature, less is known about their potential in promoting SCB among employees.

Moreover, Christian, Bradley, Wallace, and Burke (2009) in their compelling meta-analysis study, show the importance of considering distal and proximal factors in understanding and effectively managing organisational safety. The authors also addressed the importance of these factors in complimenting the institutional structure to produce desired behaviours. Based on these observations, more research is still required to understand the details of specific forms of organisational support factors for promoting SCB among employees of the mining industry. In this study, we respond to the call to expand the current understanding of work-context antecedent and SCB (Curcuruto & Griffin, 2018) and the need to establish possible mediators for managing error and innovative behaviour (Frese & Keith, 2015) in the mining context. We draw on the social exchange theory and safety literature to model the relationship among three key safety management practices (job risk assessment, safety training, and safety learning) for managing associated risks and errors in the mining industry, as well as two distinct dimensions of SCB: affiliation-oriented and change-oriented. Specifically, we seek to: (a) investigate the influence of certain context (job risk assessment) and organisational factors (safety training and safety learning) on the prediction of SCB; (b) examine the mediating role of safety learning for the relationship between job risk assessment, safety training, and SCB.

The next part draws on key literature relating to the theoretical development of SCB. This includes 1) Affiliation-oriented and change-oriented SCB, 2) Safety learning and affiliation-oriented and change-oriented SCB, 3) Job risk assessment, and 4) Safety training. Based on these topics, an integrative model was developed and a number of hypotheses were proposed. The methodology used to test the research model is then described. We used partial least squares structural equation modelling (PLS-SEM) analysis to test the proposed model. This method was found to be appropriate due to the non-normal nature of the study's data. This is followed by a presentation of results and discussion of findings. Finally, we discussed the theoretical and practical implications, limitation and conclusion.

2. Literature review
2.1 Affiliation-oriented and change-oriented SCB

SCB finds its root from the organisational citizenship behaviour (OCB) philosophy. It has also attracted similar dimensional inconsistencies reported in the OCB literature. Earlier research on SCB measured it as a unidimensional construct (Hofmann et al., 2003; Reader et al., 2017; Turner et al., 2005). However, as shown in previous studies, SCB can be measured as a multidimensional construct towards the nomological development of the construct (Curcuruto & Griffin, 2018). The main sub-structure of SCB include: affiliation-oriented and change-oriented SCB. Such conceptualisation of SCB can assess in the discovery of both distal and proximate antecedents that would generate a specific behaviour.

According to the literature, affiliation-oriented SCB focuses on risk prevention. It involves building and sustaining interpersonal and cooperative relationships which support the reduction of workplace safety outcomes (accidents, injuries and fatalities). Affiliation-oriented behaviours are also described in the literature as prosocial actions that create a supportive context for co-workers in relation to workplace safety (Curcuruto, Conchie, Mariani, & Violante, 2015). Change-oriented SCB however, has the potential to harm internal harmony and challenges existing management practices. According to Van Dyne, Graham, and Dienesch (1994), change-oriented behaviours relate to employee actions that focuses on change and improvement to existing status quo. It manifests in behaviours such as speaking up or voicing out safety concerns (Tucker & Turner, 2015), critiquing dysfunctional work procedures, and whistleblowing (MacKenzie, Podsakoff, & Podsakoff, 2011). Curcuruto et al. (2015) examined the roles of prosocial and proactive behaviours in predicting four safety outcomes (micro-accidents, property damage, near-miss events and lost-time injuries) in a chemical plant in Italy. Their findings led to significant contributions to affiliation and change-oriented behaviours towards organisational safety performance. Specifically, they found that affiliation-oriented actions can predict reduction in the rate of minor injuries and property damage, while change-oriented actions can predict the rate

of lost time injuries and near-miss event reporting. Their results support the multidimensional nature of SCB construct through the reported differences in terms of safety outcomes. A major contribution towards this new research trend lies in the application of Blau (1964) social exchange theory (SET).

Based on earlier research on behaviourism and utilitarianism, Blau (1964) argued that social exchange is contingent on rewarding reactions from others. It points to a two-sided transaction with mutual rewarding process. The contribution made by SET is largely attributed to the unspecified and discretionary nature of behaviour that lead to the development of trust, commitment and long-term relationships between the parties involved (Miles, 2012). The theory also points to the inclusion of the environment as an important influence on individual behaviour. SET underpins the basis for organisational citizenship behaviour due to the underlying exchange relationship that exists outside the formal work terms (MacKenzie et al., 2011; Podsakoff et al., 2017). Since SET stresses the importance of cost-benefit analysis based on mutual trust and commitment which develops over time, it is useful for understanding the effect of work context-factors on individual's reciprocal actions in relation to workplace safety. Converging findings from recent research suggest a shift from compliance-focused safety management in high-risk industries to proactive and voluntary individual contributions. For example, Reader et al. (2017) and Curcuruto and Griffin (2018), and Dodoo, Surienty and Zahidah (2021) in separate studies demonstrated that the SCB displayed by workers in high-risk industries was the product of SET. Their results emphasised that resilient dispositional traits and perceived organisational support can create avenues for reciprocal and discretionary SCB among employees. Although, empirical studies have established employee SCB as an outcome of social exchange relationship, research is yet to systematically validate the role of specific forms of organisational support in the exchange relationship. Thus, in the conversation on creating SCB, in particular for high-hazard industries, investigating the role of specific safety leadership (safety learning) behaviours appears fundamental.

2.2 Safety learning and affiliation-oriented and change-oriented SCB

Framed on the SET, the existing literature on SCB has demonstrated that organisational leadership and support can influence self-initiated voluntary and discretionary actions of employees in order to promote organisational safety. However, less is known about how specific leadership actions can facilitate the display of different kinds of SCB. This clearly represents a gap in knowledge and requires further research. This study identifies a specific leadership behaviour (safety learning) (Griffin & Hu, 2013) as a potential condition for supporting the enactment of affiliation-oriented and change-oriented SCB. Safety learning refers to the extent to which a leader encourages and promotes safety-related learning among employees. It is particularly critical for today's fast changing and technology driven work environment. Safety learning assists organisations to adapt to changes and continuously improve upon the existing status quo. Based on the organisational learning perspective, Griffin and Hu (2013) described learning as either a single-loop or double-loop. A single-loop learning enables employees to revise their behaviours to achieve the expected safety goals. On the other hand, double-loop learning is seen when employees demonstrate actions that either challenges or proposes changes to existing status quo, and thus resulting in improvement to safety management systems.

Frese and Keith (2015) in their review on error management described learning as one of organisation's defences against risks and errors. The authors established four forms of learning from errors. First, learning that generates knowledge about an error made, and may potentially help avoid repeating errors in the future. Second form of learning emanates from experimentation, which leads to exploring the system for a better understanding of how it operates. A third form of learning leads to developing a mindset on how to deal with errors. Lastly, learning that leads to a reduction of a person's negative emotion that normally appear as a result of an error. From the above, it can be said that learning can serve as a key resource for managing the negative emotion and anxieties that emanate from the risks identified in the environment and a basis for actions to control hazards and correct violations. This is effective when there is a shift in focus from blaming mind-set to a learning-oriented mind-set. Learning can also help employees to easily accept errors, control negative emotions that emanates from response to errors, and to stay focused on the job (Frese & Keith, 2015). The foregoing clearly demonstrates that learning is a fundamental component for producing SCB among employees. However, Frese and Keith (2015) stated that the construction of learning can be linked to a generalised individual perspective, while Griffin and Hu (2013) viewed learning from a team leader/supervisor's perspective. Both studies argued that supervisor's leadership behaviour can be influential and mirror the overall safety values of senior management.

In this study, we approach learning from supervisors' leadership perspective and argue that the values they exhibit to promote learning from unsafe actions can support employees to engage in voluntary stewardship actions to enhance organisational safety. This includes discretionary actions (e.g., speak up) (Curcuruto, Mearns, & Mariani, 2016) that are focused on change and improvement to the wider organisational safety. We proposed that safety learning will mediate the link between job risk assessment, safety training and affiliation-oriented and change-oriented SCB. Therefore, the following hypotheses are formed:

H_1: Safety learning will mediate the relationship between safety training and change-oriented SCB

H₂: Safety learning will be positively related to affiliation-oriented SCB
H₃: Safety learning will be positively related to change-oriented SCB
H₄: Safety learning will mediate the relationship between job risk assessment and affiliation-oriented SCB

2.3 Job risk assessment

Ricci, Bravo, Modenese, et. al., (2021) defined job risk assessment based on workers' subjective judgement about the severity of a risk, evaluation of both positive and negative consequences of dangers at their workplaces and how decisions are made to address them. Job risk assessment is significant for identifying hazards and risks, and controlling of hazard trajectories in the mining industry. The literature used terms like "perceived risks", "risk perception" and " job risk assessment" interchangeably to describe the practice of consistently evaluating risks/hazards that exists in the work place (e.g., threats to lightning levels, ventilation, space, and humidity levels) (Cui et al., 2013) before, during and after task. In the mining industry, risks of accidents, health risks, work pacing, pressure and risks control (Parker et al., 2017), were commonly used. These terms help in explaining the interaction between individuals and the work environment, and potential behaviours that could emerge. Research suggests that job risk assessment generates cognitive alertness and consistent efforts to avoid errors to promote safety performance. Empirical findings from nuclear plant work-context (Kouabenan, Ngueutsa, & Mbaye, 2015), mining (Cui et al., 2013), transport (Ram & Chand, 2016) and construction (Xia, Wang, Griffin, Wu, & Liu, 2017) have shown the influence of job risk assessment on safety climate, management's commitment to safety, and safety performance among workers. However, Christian et al. (2009) found no significant relationship between job risk perception and safety performance. According to Nahrgang, Morgeson, and Hofmann (2011), perceived risks and hazards can be associated with burnout among employees (McCaughey, Turner, Kim, DelliFraine, & McGhan, 2015). A recent study by Xia, Xie, Hu, Wang, and Meng (2020) also found that job risk perception was negatively related to the safety motivation and safety behaviour of workers. From the foregoing, however, inconsistent views on the impact of job risk assessment and safety performance have emerged. Hence, additional research is required to clarify the conditions through which the relationship between job risk assessment and work context factors could be more salient, particularly towards voluntary SCB.

We argue that in order to improve safety in high-risk industries, safety citizenship actions should be considered, which are also dependent on the job risk assessment of employees. Research suggests that supportive workplace environment is particularly useful for highly structured and repetitive tasks (Edmondson, 1999) such as job risk assessment. Drawing on the reciprocal relationship principle espoused by SET, we suggest that, a learning-oriented mindset of supervisors can serve as a supportive resource that could potentially manage the negative emotions and anxieties associated with job risk perception, and form the bases for emerging actions that seek to reduce safety violations and errors. In line with the above, this study proposed the following hypothesis:
H₅: Job risk assessment will be positively related to safety learning

2.4 Safety training

Safety training forms an essential part of safety management systems in high-risk organisations. It increases employee awareness of potential hazards and risks inherent in a job (Freitas & Silva, 2017). It also improves behavioural skills, knowledge of job-related attitudes, and serves as mentorship system for new employees (Vinodkumar & Bhasi, 2010). Previous studies have established either directly or indirectly positive and significant relationships between safety training and attitudes with individuals' beliefs and adoption of positive safety behaviours (Ricci, Chiesi, Bisio, Panari, & Pelosi, 2016; Vinodkumar & Bhasi, 2010). A recent study found that safety training can serve as a critical success factor towards the enforcement of safety management system, in which the first can help reduce resistance and encourage proactive behaviours among employees (Hong, Ramayah, & Subramaniam, 2018). The foregoing not only emphasise safety training as a core practice for managing workplace incidents in high-risk industries, but also highlights its potential to promote SCB among employees.

However, Christian et al., (2009) showed that behaviours that are perceived as core and compulsory to a person's job have no association with safety climate. The authors further stressed that the effect of safety training on safety performance is possible through a proximal factor. Namian, Albert, Zuluaga, and Behm (2016) also demonstrated that training with a minimal engagement from learners was not significantly associated with hazard identification and job risk perception. Ricci and Nucci (2022) emphasised that, matching learners training needs with an effective methodology are important factors for improving safety behaviour. This was also supposed by Freitas and Silva (2017) who established that the effectiveness of training can be associated with certain individual characteristics (cognitive abilities, personality and motivation), work environment (OSH professional's support, supervisor's support, opportunity for transfer), and training design and delivery (see Figure 1 for research model). The implicit implication of the foregoing points to the significance of supportive work-context environment in relation to training. In the light of this, we proposed the

following hypothesis:

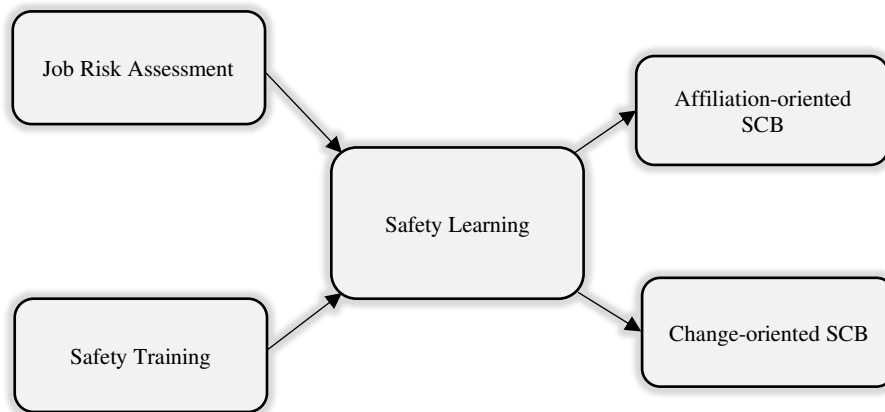*H₇:* Safety training has a significant positive relationship with safety learning

Figure 1: Path diagram of job risk assessment, safety training, and affiliation-oriented and change oriented SCB

3   Methods

3.1 Participants

Participants were operational process employees of six- large-scale gold mining companies in Ghana, who responded to a survey between June and November, 2019. Mining industry operates on two main levels in Ghana namely: large-scale mining and small-medium scale/artisanal mining. The former which is the focus of this study is dominated by multi-national companies, are well resourced, uses highly mechanised and automated processes in their operations, and have functioning safety management systems (Dodoo, 2021). The activities of the operational process employees (which cover the core mining functions) put them in direct contact with workplace hazards making them the primary agents of future-directed safety behaviour (Dodoo et al., 2021). To ensure a balanced representation from all the operational process departments, the study stratified participants into exploration (geology), technical service (engineering), production, plant and metallurgy, heavy mining equipment, health, safety and environment and protection services.

Prior to data collection, standard informed consent procedures were followed and the full research protocol was reviewed and data confidentiality agreement, signed between researcher and Human Resource and Research Departments of each of the participating companies. Employee participation in the survey was voluntary and anonymous, and questionnaires were administered onsite. The main data collection method was the drop off/pick up self-administered strategy via printed multiple-item questionnaires. The first author spent six months in Ghana visiting the large-scale gold mining companies located in various regions across the country to negotiate for access, distribute and collect responses to questionnaires. No monetary or other incentives for participation were provided. Questionnaires were administered to a sample of 460 operational process department employees in six large-scale mining companies across Ghana. The completed questionnaires were received from 325 employees, which represents an overall response rate of 76%. Out of the completed questionnaires, 316 were found usable for further analysis. During the data collection exercise, Company D withdrew its permission that allowed the employees to participate in the research. This resulted in 70 uncompleted questionnaires. Overall, 79 questionnaires were found unusable due to non-response, excessive missing data and suspicious response pattern). These were excluded from further analysis (see Table 1 for details of participating companies and overall response rate). In accordance with ethical principles of anonymity and confidentiality of research participants information, their affiliated companies and their names were withheld in this study.

Table 1

Participating Companies and Response Rate

No	Name of Company	Drop off	Pick-up	Return Rate (%)	Usable	Unusable
1	Company A	80	74	92.5	71	3
2	Company B	80	45	56.3	45	0
3	Company C	50	50	100	49	1
4	Company D	80	80	100	10	70***
5	Company E	80	61	76.3	60	1
6	Company F	90	85	94	81	4
Total		460	395	71	316	79

3.2 Measurement

The key constructs in the research model proposed in this study were adapted from existing and validated scales from the occupational safety and health literature. The selection of scales was done based on a careful review of literature and theory on high-risk industries. In view of the study's objectives, two distal constructs (job risk assessment and safety training) and one proximal construct (safety learning) emerged as key antecedents of affiliation-oriented (safety stewardship) and change-oriented (employee safety voice) SCB. The questionnaire contained 22 questions to measure participants' perceptions about these antecedents and SCB constructs, and 6 demographic questions. We used the Likert format response to measure administered scale, which are briefly described below.

Safety citizenship behaviour

To evaluate participants' propensity to engage in the two distinct SCB, a validated measurement was adapted from Curcuruto and Griffin (2018), which consist of five-item scale each for safety stewardship and safety voice. The scale was used to examine the extent to which the performance of SCB occur among workers of a chemical plant hosted in four countries namely; United Kingdom, Italy, Russia and Switzerland, and achieved a reliability coefficient of .90. Safety stewardship is generally used to describe individuals' display of behaviours that support interpersonal relationship and protect the safety and health of colleagues in the workplace. Sample items include, "I protect co-workers from risky situations." Employee safety voice that describe participants' display of change can motivate initiatives and actions that promote organisational safety. Sample items include, "I have been involved in discussing new ways to improve safety." All participants were requested to indicate the frequency with which they engaged in the behaviours within the last quarter on a Likert scale with 0 indicating "never" to 4 indicating "always". The mean value of the Cronbach's alpha obtained in the current sample was 0.84 and 0.71 for safety stewardship and employee safety voice, respectively.

Job risk assessment: As pointed out in the literature review, job risk covers both task-related and control procedures and hazardous environment. Seven items were adapted from Parker et al. (2017) and Cui et al. (2013) to measure and operationalise job risk assessment in the context of this study. Parker et al. (2017) developed a questionnaire to assess employees' perception of the job risk and control systems in the Australian mining industry with an appreciable reliability co-efficient of .85. In addition, Cui et al., (2013) developed a measurement to assess employees' perception about hazardous environment in a large-scale coal mining in China with a co-efficient value of .82. The adaptation of the validated instruments from Parker et al., (2017) and Cui et al., (2013) was useful for assessing all the risk elements (task risk, control system and hazardous environment) that pertain to a large-scale mining industry context. Sample items include, "perception of high accident or health risks are as a result of work", "there are safety threats related to the lighting levels in my work area." This scale was scored using a five-point Likert scale (1 denoting "strongly disagree" to 5 denoting "strongly agree). The Cronbach's alpha obtained for this scale with the current sample was 0.86.

Safety training: We used five-item scale from Vinodkumar and Bhasi (2010) to assess participants' perceptions about the safety training provided by the companies. This scale identified management practices, the knowledge and procedures required for an organisation to work safety. Vinodkumar and Bhasi (2010)'s instrument was used to assess the perception of safety training of workers in a highly volatile work environment (chemical processing) with a high reliability co-efficient of .82. Sample items include, "my company gives comprehensive training to employees in workplace health and safety issues." Items were rated on a five-point Likert scale with 1 indicating "strongly disagree" to 5 indicating "strongly agree." The Cronbach's alpha obtained for this scale was 0.80.

Safety learning: This construct describes the extent to which supervisors' leadership encourages divergent thinking to promote learning from errors with respect to workplace safety. Items assessing safety learning was based on Griffin's and Hu's (2013) operationalisation of specific safety leadership behaviour. The instrument was used in a multi-sectoral job context such as construction, healthcare, tourism and hospitality) in Australia with a co-efficient alpha value of .90. The scale comprised a two-item measurement, sample items include "my supervisor encourages new ways of thinking about safety." Measures were scored on a five-point Likert scale with 1 denoting "strongly disagree" to 5 denoting "strongly agree). The Cronbach's alpha obtained for the current sample was 0.69.

3.3 Data analysis

A quantitative descriptive analysis was performed using SPSS 24.0 in order to describe the study's sample in terms of certain demographic characteristics and descriptive statistics. Given the multiple independent and dependent variables involved in the study, the significant effects of the hypothesised direct and indirect effect were tested via smartPLS software 3.0 (Ringle, Wende, & Becker, 2014). PLS-SEM analysis was used to validate the proposed theoretical model.

4. Results

4.1 Demographic results

The mean age of the sample was 33. 27 years. The sample was predominantly males (77.8%), while females were 20.6% the remaining 1.6% preferred not to indicate. The majority of participants (48.4%) had a bachelor degree educational qualification, followed by diploma (19.3%), basic/secondary school (16.9%), post-graduate degree (11.4%), and certificate (3.2%). The mean years of work experience of the sample was 4.9 years, and most of the respondents (55.8%) were engaged directly by the parent companies while 43.4% were engaged by other contracting companies. In terms of job roles, the sample was quite heterogenous and highly representative of the core mining operational work processes. This includes metallurgists (8.5%), geologists (8.9%), drillers/blast-men, haul drivers (3.8), supervisors (12%), shift bosses (.9%), mechanical/electrical engineers, maintenance planning engineers (21.8%), safety managers/mine controllers (1.6%), mining engineers (7.3%), laboratory technicians (1.6%), rescue officers (4.4%), safety and environment officers (20.6%). These core mining activities require highly trained workers with specialised technical skills essential for them to be able to perform tasks efficiently and safely. It is therefore not surprising to find a highly literate employees engaged in the core mining functions. In addition, it is worth mentioning that the large-scale mining companies in Ghana outsource a number of their core functions to contracting companies as a business strategy. This explains why 43.4% of employees are engaged by contracting companies.

4.2 Measurement model

The quality of the measurement model was ascertained by means of standard evaluation criteria established by Hair et al. (2017). Table 2 shows the assessment results of the measurement model. In terms of reliability, indicator loadings were > 0.7, and loadings which were < 0.7 with average variance extracted (AVE) > 0.5 were maintained in the measurement model. The Composite reliability (CR) results for all the constructs were satisfactory (> 0.7) with an AVE value > 0.5. Loadings < 0.7 with AVE < 0.5 were deleted from the model to improve the overall AVE. As such, two items were deleted from the measurement model (ESV3 – 0.475, ESV5 – 0.610). Also, the discriminant validity assessment was estimated by the proposed hetero-trait-mono-trait (HTMT) ratio of correlation (Henseler, Ringle, & Sarstedt, 2015). Table 3 shows that all measurements have achieved adequate discriminant validity since all values were below the conservative threshold value of HTMT 0.85 and HTMT 0.90.

Table 2: Results of the measurement model

Construct	Items	Factor Loading	Composite Reliability	Average Variance Extracted (AVE)
Employee safety voice	ESV1	0.718	0.800	0.573
	ESV2	0.840		
	ESV4	0.706		
Job risk assessment	JRA1	0.717	0.884	0.521
	JRA2	0.777		
	JRA3	0.684		
	JRA4	0.733		
	JRA5	0.687		
	JRA6	0.727		
	JRA7	0.723		
Safety leadership learning	SLL1	0.903	0.770	0.631
	SLL2	0.669		
Safety stewardship	SST1	0.857	0.882	0.602
	SST2	0.742		
	SST3	0.858		
	SST4	0.637		
	SST5	0.762		
Safety training	ST1	0.664	0.856	0.543
	ST2	0.762		
	ST3	0.783		
	ST4	0.761		
	ST5	0.708		

ESV: employee safety voice; JRA: job risk assessment; SLL: safety learning leadership; SST: safety stewardship; and ST: safety training

Table 3: Results of hetero-trait-mono-trait ratio of correlation

		1	2	3	4	5
1	ESV					
2	JRA	0.210				
3	SLL	0.258	0.357			
4	SS	0.694	0.224	0.313		

| 5 | ST | 0.078 | 0.310 | 0.662 | 0.183 | |

4.3 Assessment of the structural model

Five key steps were followed to assess the significance of the proposed relationships established in this study. We used PLS-SEM to evaluate aspects such as collinearity, significance of structural model relationship (*t* value (1.645): a ratio of the difference between the means; and *p* value (.05): the level of marginal significance within a statistical hypothesis), R^2 measures (values between 0 to 1 represent coefficient of determination based on the proportion of how the variance for a dependent variable can be explained by an independent variable), effect size (f^2 =0.02 indicates a small effect; 0.15 indicates a medium effect; and 0.35 indicates a large effect), and assessment of predictive relevance or Q^2 (explain whether a model has predictive relevance or not (> 0 is good predictive relevance) (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). The collinearity of all constructs was assessed using the variance inflated factor (VIF). The results showed that all the inner VIF values for the independent variables (safety learning, safety stewardship, and employee safety voice) that are needed to determine the lateral multicollinearity were lower (1.000 – 1.076) than 3.0, indicating that collinearity is not an issue for the study's constructs and model. The significance of the hypothesised relationships in the structural model was derived from bootstrapping with 5000 samples based on a one-tailed analysis. As shown in Table 3, all the path coefficients were statistically significant with *t* values > 1.645 at *p* < 0.05 of significance. More specifically, job risk assessment (β = 0.124; SE = 0.050) and safety training (β = 0.405; SE = 0.054) each had a significant (*p* < .01; *p* < 0.01) and positive relationship with safety learning. Similarly, path coefficient was statistically significant for safety learning and employee safety voice (β = 0.138; SE = 0.050; *p* < 0.01) and safety stewardship (β = 0.201; SE = 0.053; *p* < 0.01). The R^2 values for safety learning (0.206), safety stewardship (0.041), and employee safety voice (0.019) indicates a moderate and weak combined effect of independent variables on the dependent variables (Cohen, 1988). Further, the effect size results or f^2 showed that both job risk assessment (0.018) and safety training (0.192) were close to small and medium size contribution for the variance in R^2 for safety learning. We also found that the effect size of safety learning had a minimum effect on safety stewardship (0.042) and employee safety voice (0.019).

Table 3: Results of the structural model

No	Path relationship	Beta	SE	*t* value	*p* value	Decision	f^2	Confidence Interval (BC)	
								LL 5.00%	UL 95.00%
1	JRA>SLL	0.124	0.050	2.466	0.007	Supported	0.018	0.036	0.197
2	SLL>ESV	0.138	0.050	2.746	0.003	Supported	0.019	0.045	0.200
3	SLL>SST	0.201	0.053	3.830	0.000	Supported	0.042	0.103	0.274
4	ST>SLL	0.405	0.054	7.503	0.000	Supported	0.192	0.305	0.484

p < .01

The Q^2 value of the model was assessed by using the Stone-Geisser's Q^2 (Sarstedt, Ringle, & Hair, 2017). Based on the blindfolding procedure, Q^2 evaluates the predictive validity of a model via PLS. As recommended by Hair et al (2014), values larger than zero indicates that the exogenous constructs have predictive relevance for the endogenous construct. The Q^2 values were 0.009 for employee safety voice, 0.118 for safety leadership learning, and 0.020 for safety stewardship. All values were > 0, indicating that the research model has a good predictive relevance.

The study hypothesised that the relationship among job risk assessment, safety training and affiliation-oriented (safety stewardship) and change-oriented (employee safety voice) can be mediated by safety learning. We applied a mediation testing approach by Preacher and Hayes (2008) to test the study hypotheses. The bootstrapping procedure was performed with 5000 samples based on two-tailed analysis by assessing relationships at a significance level of *p* < .05 and critical *t* value > 1.96. The results, as presented in Table 4, support two out of the four hypothesised relationships. Table 4 shows that the indirect relationships of safety training with safety stewardship [β=0.082, SE=0.025, *t* = 3.302, *p* < .01] and employee safety voice [β = 0.056, SE = 0.022, *t* = 2.552, *p* < .05] were mediated by safety learning. The results, however, showed no mediation for safety learning in the relationship between job risk assessment, safety stewardship, and employee safety voice.

Table 4: Results of the mediating effect

No	Path relationship	Beta	SE	*t* value	*p* value	Decision	Confidence Interval (BC)	
							LL 2.5%	UL 97.5%
1	JRA>SLL>ESV	0.017	0.012	1.416	0.157	Not Supported	-0.001	0.040

2	ST>SLL>ESV	0.056	0.022	2.552	0.011	Supported	0.004	0.092
3	JRA>SLL>SST	0.025	0.015	1.670	0.095	Not Supported	0.003	0.053
4	ST>SLL>SST	0.082	0.025	3.302	0.001	Supported	0.037	0.128

5. Discussion

This study dedicated efforts to understanding the mechanisms by which job risk assessment, safety training, mediated by supervisors' safety learning behaviour influence SCB among employees of Large-scale mining industry in Ghana. The empirical results yielded a number of significant findings. The results showed a significant and positive association between job risk assessment and safety learning ($p < .01$). The finding suggests that evaluation of risks/hazards inherent in work tasks and environment were associated with employees' perceptions of their supervisors' learning-oriented behaviour. This finding is significant as it points out that, job risk assessment is salient in an environment where supervisors exhibit open-minded behaviours. This finding supports the argument that supervisors play a critical role in promoting safety behaviour among their employees (Griffin & Hu, 2013). Our finding was consistent with Frese and Keith (2015) who argued that learning-oriented mindset serves as a critical support for managing the emotions and anxieties associated with risk and hazards in the work environment.

Also, our study found a significant and positive relationship between safety training and safety learning ($p < .01$). The results provide empirical evidence of the role of supervisors' specific leadership behaviours towards the effectiveness of any management practice. In addition, it is assumed that safety training is a significant management practice in the mining industry and it is counted on to equip employees with the procedural knowledge and skills to work safely. Given the fact that employees have limited or no input in the training content and delivery, the finding indicates that supervisors' magnanimity to allowing employees some level of discretion to imagine new ways of thinking about safety is of tremendous value to the work environment. This is in line with the existing literature by Freitas and Silva (2017), which found an association between safety training and supervisor's supportive behaviour.

Our results showed a significant and positive relationship between safety learning and affiliation-oriented SCB ($p < .01$). When leaders demonstrate a desire for learning, other employees will be inspired to display altruistic behaviours that support the development of interpersonal relationship relative safety. Also noteworthy is the finding of significant and positive relationship between safety learning and change-oriented SCB ($p < .01$). We found that supervisor behaviour as being eager to learn and explore new ways of safety practices can inspire confidence in employees to speak-up, admit to and report errors, suggest ways of improving current and future safety in the workplace. Our findings were in line with Griffin and Hu (2013) in that safety learning, as a moderator, was found to be associated with safety compliance and extra-role actions.

We argued that safety learning will mediate the relationships between job risk assessment and affiliation-oriented and change-oriented SCB. However, the results did not support this assumption ($p > 0.05$). The evidence suggests that the disconnection between job risk assessment and SCB, despite the influence of safety learning, runs deeper into the overall institutional structures. Safety learning was an effective resource on the lateral level relationship but not strong enough to generate speak-up and prosocial behaviours. The findings provide important insights into the role of supervisors in high-risk industries. Although empirical findings provide evidence of their effectiveness, the current evidence from this study indicates how limited they are in bridging the gap between employees and management. The findings suggest two implications for further empirical probing: 1) the presence of boundaries around the lateral relationship between employees and supervisors, and 2) a direct relationship between job risk assessment and SCB. Collectively, the findings indicate that employees' perceptions of management practices made them more concerned about their abilities to prevent risks/hazards from occurring. This finding support the work of Christian et al. (2009) who argued that safety climate may not be affected when employees perceive a behaviour as a core and compulsory component to their work. Hence, safety learning support does not condition an association between hazard/risk assessment towards the need for change to improve work process and increase safety.

The study found a mediation of safety learning in the relationship between safety training and affiliation-oriented and change-oriented ($p < .01$). The evidence suggests that supervisors' ability to inspire curiosity can result in employees investing more time in translating knowledge acquired through training to support the development of interpersonal relationships through altruistic behaviours. In addition, supervisors' learning-oriented mindset was found to facilitate the translation of safety training to identify gaps in safety systems and make personal commitment to improve workplace safety through speaking-up, admitting to errors and reporting of safety violation, and supporting current and future organisational safety needs. This finding is consistent with the argument by Namian et al. (2016) who found that effective learning interventions can enhance learners' safety performance.

Our findings provide empirical evidence that demonstrate the linkage between job risk assessment, safety training, and safety learning towards SCB. These links can support the application of SET in mining related research. The findings fill a gap in the literature on safety research by clarifying the relationships between the study's construct and SCB, which have not been systematically investigated before. This study has answered the

call of Curcuruto and Griffin (2018) for further research into the relationship between work-context related factors in relation to SCB among employees. The findings also deepen our understanding of SCB and the conditions for generating them in a mining context. We show that the anxiety and stress associated with risks and dangers associated with minework can be reduced through the learning-oriented mindset of supervisors.

6. Theoretical and practical implications

The findings have implications for occupational safety, health research, and practitioners, in particular for those in high-risk industries such as mining. This study contributes to the nomological network of SCB by demonstrating the interrelationships between work-context, safety learning and SCB. Specifically, the study contributes to the previous literature on SCB by incorporating safety learning to extend understanding of how a specific safety leadership behaviour can enhance SCB of employees. Although, Griffin and Hu (2013) found a moderating effect for safety learning in relation to safety monitoring and safety participation, our finding contributes to the literature by showing how safety learning mediates the effect of safety training and employee-initiated future-directed behaviours (e.g., affiliation-oriented and change-oriented SCB). The early conceptualisation of SCB construct has established the importance of safety leadership towards SCB (Hofmann et al., 2003; Curcuruto & Griffin, 2018), but it did not investigate the specific type of behaviours that supports specific forms of SCB. Other leadership forms (particularly safety learning) can result in a significant effect on work-context related factors such as job risk assessment and safety training.

Existing research points to a gap in knowledge regarding the assessment of risks/hazards as the cause of mine related incidents, leading to fatalities, injuries and diseases (Bahn, 2013). Owing to the above, our finding suggests that in order for the mining industry in Ghana to improve its safety, the management must recognise and stress on safety learning behaviours of supervisors. The evidence from the study suggests that learning-oriented mindset displayed by supervisors can serve as an important resource for employees and ensure the effectiveness of organisations safety defence mechanisms. We also highlighted the need to build a conscious safety learning behaviour among supervisors who will act as mentors to support growth and learning among employees. This can offer a great benefit to the organisation and will likely enhance SCB among employees. This study also argues that providing sustained safety performance is a key for the survival of today's organisations, in particular high-risk industries. Therefore, this study suggests the need for practitioners to reflect on supervisors' roles as that of mentoring position rather than "error monitors". Changing such perceptions will likely help to create active workers who can easily display voluntary SCB rather than being perceived as "yes men/women."

7. Study limitations

In terms of research design, limitations could arise from the use of single-source self-report data, thus creating issues of common method bias. However, the potential problem of common method bias was controlled by the use of both non-statistical and Harman' single factor methods. Still, this limits information on individual's expectations and nuanced views about the study's variables. Future research may consider mixed-method approach to provide further interpretation to findings. Another limitation could arise from the use of cross-sectional design. We measured employee safety voice and safety stewardship variables based on frequency of action in the last quarter. The respondents involved in this study are likely to be influenced by retrospective sense-making and potentially distort their actual behaviour. However, we argue that this may not be a major issue for the study because participants were assured of anonymity of their responses.

8. Conclusion

The mining industry continues to explore ways to promote sustainable safety in the workplace. In the light of the reviewed literature, two key practices (job risk assessment and safety training) were emerged as the mainstay of safety management. Yet, a growing empirical literature reports ambivalent views regarding their influence on employee safety behaviour. This study is among the first attempts at exploring the role of work-context antecedents in enhancing SCB in six-large mining companies in Ghana. Although our findings showed important relationships for safety learning and job risk assessment, safety training, affiliation-oriented and change-oriented SCB, it also failed to mediate the effect of job risk assessment towards SCB. Future research can further explore the role of individual disposition as mediators that might be responsible for the mediating relationship. In addition, future research is required to explore the roles of other leadership styles that could generate SCB among employees. Although we found a mediation effect for safety learning and altruistic and change-oriented behaviours, the study, however, did not explore the direction of the behaviour. Therefore, it will be of great interest if further research examines the direction of speak-up behaviours, and whether employees feel comfortable to speak-up to supervisors or management.

This study increases our understanding of how learning-oriented behaviour (safety learning) of supervisors can influence employee safety voice and stewardship behaviours in the mining industry. Our result supports the association among job risk assessment, safety training, and safety learning. These findings can help high-risk

industries to better understand the factors that motivate employees to voluntarily expand their roles and enact safety citizenship behaviours. Additionally, our results can help mining industries to introduce some dynamism into the roles of supervisors and leaders.

Reference
Bahn, S., 2013. Workplace hazard identification and management: The case of an underground mining operation. Safety Science 57, 129-137.
Blau, P. M., 1964. Social exchange theory. Retrieved September, 3(2007), 62.
Carter, R. A., 2016. Mine Safety: Working Within the System. Engineering and Mining Journal, 217(3), 50.
Christian, M. S., Bradley, J. C., Wallace, J. C., Burke, M. J., 2009. Workplace safety: a meta-analysis of the roles of person and situation factors. In: American Psychological Association.
Cohen, J., 1988. Statistical power analysis for the behavioral sciences . Hilsdale. NJ: Lawrence Earlbaum Associates, 2.
Cui, L., Fan, D., Fu, G., Zhu, C. J., 2013. An integrative model of organizational safety behavior. Journal of Safety Research 45, 37-46.
Curcuruto, M., Conchie, S. M., Mariani, M., Violante, F., 2015. The role of prosocial and proactive safety behaviors in predicting safety performance. Safety Science 80, 317-323.
Curcuruto, M., Griffin, M. A., 2018. Prosocial and proactive "safety citizenship behaviour"(SCB): The mediating role of affective commitment and psychological ownership. Safety Science 104, 29-38.
Curcuruto, M., Mearns, K. J., Mariani, M. G., 2016. Proactive role-orientation toward workplace safety: Psychological dimensions, nomological network and external validity. Safety Science 87, 144-155.
Dodoo, J. E., Al-Samarraie, H., 2019. Factors leading to unsafe behavior in the twenty first century workplace: a review. Management Review Quarterly, 1-24.
Dodoo, J. E., 2021. Antecedents of safety citizenship behaviour of employees in Ghana's mining industry: The mediating effect of psychological safety [Unpublished doctoral thesis]. Universiti Sains Malaysia.
Dodoo, J. E., Surienty, L., Zahidah, S., 2021. Safety citizenship behaviour of miners in Ghana: The effect of hardiness personality disposition and psychological safety. Safety Science 143, 105404.
Elgstrand, K., Sherson, D. L., Jørs, E., Nogueira, C., Thomsen, J. F., Fingerhut, M., . . . Oñate, E., 2017. Safety and Health in Mining: Part 2. Occupational Health Southern Africa 23, 10-20.
Freitas, A. C., & Silva, S. A., 2017. Exploring OHS trainers' role in the transfer of training. Safety Science 91, 310-319.
Frese, M., & Keith, N., 2015. Action errors, error management, and learning in organizations. Annual Review of Psychology 66, 661-687.
Griffin, M. A., & Curcuruto, M., 2016. Safety climate in organizations. Annual Review of Organizational Psychology and Organizational Behavior 3, 191-212.
Griffin, M. A., & Hu, X., 2013. How leaders differentially motivate safety compliance and safety participation: The role of monitoring, inspiring, and learning. Safety Science 60, 196-202.
Hair Jr, J., Sarstedt, M., Hopkins, L., Kuppelwieser, G. V., 2014. Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. European Business Review 26, 106-121.
Henseler, J., Ringle, C. M., Sarstedt, M., 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science 43, 115-135.
Hofmann, D. A., Morgeson, F. P., Gerras, S. J., 2003. Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: safety climate as an exemplar. Journal of Applied Psychology 88, 170.
Hong, C. C., Ramayah, T., Subramaniam, C., 2018. The relationship between critical success factors, internal control and safety performance in the Malaysian manufacturing sector. Safety Science 104, 179-188.
Komljenovic, D., Loiselle, G., Kumral, M., (2017). Organization: A new focus on mine safety improvement in a complex operational and business environment. International Journal of Mining Science and Technology 27, 617-625.
Kouabenan, D. R., Ngueutsa, R., Mbaye, S., 2015. Safety climate, perceived risk, and involvement in safety management. Safety Science 77, 72-79.
MacKenzie, S. B., Podsakoff, P. M., Podsakoff, N. P., 2011. Challenge-oriented organizational citizenship behaviors and organizational effectiveness: Do challenge-oriented behaviors really have an impact on the organization's bottom line? Personnel Psychology 64, 559-592.
McCaughey, D., Turner, N., Kim, J., DelliFraine, J., McGhan, G. E., 2015. Examining workplace hazard perceptions & employee outcomes in the long-term care industry. Safety Science 78, 190-197.
Miles, J. A. (2012). Management and organization theory: A Jossey-Bass reader (Vol. 9). San Francisco: John Wiley & Sons.

Nahrgang, J. D., Morgeson, F. P., Hofmann, D. A., 2011. Safety at work: a meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. Journal of Applied Psychology 96, 71.

Namian, M., Albert, A., Zuluaga, C. M., Behm, M., (2016). Role of safety training: Impact on hazard recognition and safety risk perception. Journal of Construction Engineering and Management 142, 04016073.

Parker, A. W., Tones, M. J., Ritchie, G. E., 2017. Development of a multilevel health and safety climate survey tool within a mining setting. Journal of Safety Research 62, 173-180.

Podsakoff, N. P., Podsakoff, P. M., Mackenzie, S. B., Maynes, T. D., Whiting, S. W., Spoelma, T. M., 2017. Multilevel Antecedents of Organizational Citizenship Behavior. In P. M. Podsakoff, S. B. Machenzie, & N. P. Podsakoff (Eds.), The Oxford Handbook of Organizational Citizenship Behavior (pp 1- 88), UK: Oxford University Press.

Ram, T., Chand, K., 2016. Effect of drivers' risk perception and perception of driving tasks on road safety attitude. Transportation research part F: Traffic Psychology and Behaviour 42, 162-176.

Reader, T. W., Mearns, K., Lopes, C., Kuha, J., 2017. Organizational support for the workforce and employee safety citizenship behaviors: A social exchange relationship. Human Relations 70, 362-385.

Ricci, F., Chiesi, A., Bisio, C., Panari, C., Pelosi, A., 2016. Effectiveness of occupational health and safety training: A systematic review with meta-analysis. Journal of Workplace Learning 28, 355-377.

Ricci, F., Nucci, M., 2022. Safety Integrated Model-training (SIM-t) and its evaluation: A safety training proposal for mechanical companies. Safety Science, 146, 105538.

Ricci, F., Bravo, G., Modenese, A., De Pasquale, F., Ferrari, D., Bello, M., ... & Gobba, F., 2021. Risk Perception and Ethnic Background in Construction Workers: Results of a Cross-Sectional Study in A Group of Trainees of a Vocational School in Italy. European Journal of Investigation in Health, Psychology and Education 11, 96-111.

Ringle, C., Wende, S., Becker, J., 2014. Software SmartPLS 3.0. In: SmartPLS, Hamburg, available at: www. smartpls. com.

Sarstedt, M., Ringle, C. M., Hair, J. F., 2017. Partial least squares structural equation modeling. Handbook of Market Research, 26, 1-40.

Stemn, E. (2018). Analysis of Injuries in the Ghanaian Mining Industry and Priority Areas for Research. Safety and Health at Work 10, 151-165.

Tucker, S., Turner, N., 2015. Sometimes it hurts when supervisors don't listen: The antecedents and consequences of safety voice among young workers. Journal of Occupational Health Psychology 20, 72-81.

Turner, N., Chmiel, N., Walls, M., 2005. Railing for safety: job demands, job control, and safety citizenship role definition. Journal of Occupational Health Psychology 10, 504-512.

Turner, S. (2017). Going Beyond Compliance. Iron & Steel Technology 1, 31-33.

Van Dyne, L., Graham, J. W., Dienesch, R. M., 1994. Organizational citizenship behavior: Construct redefinition, measurement, and validation. Academy of Management Journal 37, 765-802.

Verma, S., Chaudhari, S., 2017. Safety of Workers in Indian Mines: Study, Analysis, and Prediction. Safety and Health at Work 8, 267-275.

Vignoli, M., Mariani, M. G., Guglielmi, D., Violante, F. S., 2017. Leadership styles and self-efficacy in determining transfer intentions of safety training. Journal of Workplace Learning 30, 65-76.

Vinodkumar, M., Bhasi, M., 2010. Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. Accident Analysis & Prevention 42, 2082-2093.

Xia, N., Wang, X., Griffin, M. A., Wu, C., Liu, B., 2017. Do we see how they perceive risk? An integrated analysis of risk perception and its effect on workplace safety behavior. Accident Analysis & Prevention 106, 234-242.

Xia, N., Xie, Q., Hu, X., Wang, X., Meng, H., 2020. A dual perspective on risk perception and its effect on safety behavior: A moderated mediation model of safety motivation, and supervisor's and coworkers' safety climate. Accident Analysis & Prevention 134, 105350.