

Conference Paper

Defining the Safety Leadership Component of Mining: A Literature Review

Putri Ariscasari and Ridwan Zahdi Syaaf

Occupational Health and Safety Department, Faculty of Public Health, Universitas Indonesia, Jl. Margonda Raya, Beji, Pondok Cina, Kota Depok, Jawa Barat 16424, Indonesia

Abstract

Mining is one of the most dangerous of all industries, and safe coal mining is highly dependent on workers' proper behavior and a safe environment, given that most coal mining accidents are caused by human factors. One way to reduce human error is to implement effective safety leadership. Safety leadership supports the management's positive view of safety; without any safety leadership, it would be difficult to achieve good safety performance. When developing safety leadership, it is essential to establish a positive safety culture that will reduce the number of workplace accidents. This article aims to explore the components of safety leadership, especially in the coal mining industry. This is a narrative literature review that identifies the components of safety leadership in the mining industry. Based on the review, the authors have identified the main components of safety leadership to be safety coaching, caring about safety, and controlling for safety. Safety coaching explains the vision and objectives of the safety program and establishes its credibility, influences safety values and explains the consequences of the work performed. Caring for safety is a process of communication, feedback and collaboration among leaders to build relationships with workers. Controlling for safety emphasizes worker accountability, worker safety, and workers' actions according to defined standards.

Keywords: safety leadership, safety culture, coal mining, safety coaching, safety caring, safety control

Corresponding Author:

Ridwan Zahdi Syaaf
ridwan-syaaf@ui.ac.id

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1. Introduction

Daily mining operations are one of the most dangerous of all industries because of the nature of the job; it is high-risk, in terms of both safety and health, and in all its specific activities, the use of high technology, work hazards, and due to its inherent dynamic risks [1]. The coal mining industry has contributed substantially to Indonesian

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economic growth, and by 2016, coal production in Indonesia had reached 419 million tons, with a production value of US\$61.80 per ton. Coal exports account for 50 percent of Indonesia's total exports and lead to foreign exchange contributions in excess of US\$29 million per year [2]. The incidence of mine accidents in Indonesia between 2011 and 2016 was on a downward trend, with 146 events in 2016, compared to a high, in 2013, of 232 cases [3]. Accident and injury anticipation and prevention efforts must be controlled to realize a zero accident rate in Indonesia's mines.

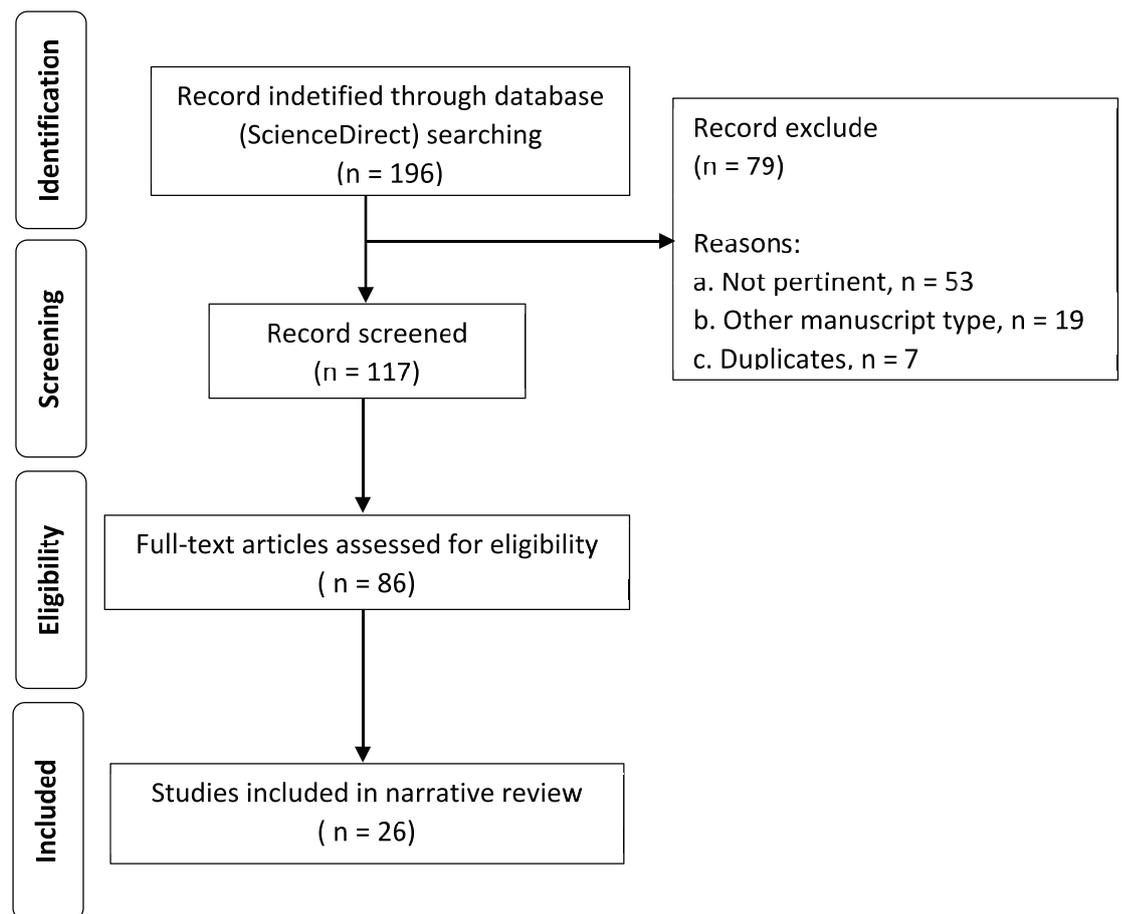
Most mining accidents are the result of human error, and unsafe worker behavior is often the result of a lack of organization and management systems that have unsafe effects on workers. One way to reduce human error is to apply and develop effective safety leadership. Such behaviors have a significant impact on workers' behavior and workplace accidents and can encompass, for example, safety communication, training procurement, incentives, and so on [4, 5]. Safety leadership is one of the factors that affects firms' safety performance, because the leadership is responsible for providing safe working opportunities for its employee. Safety leadership should be applied to all organizational levels to ensure that all areas have a high commitment to safety, as workers pay careful attention to leaders' behaviors, attitudes, and actions on safety and then imitate them. Poor leadership behavior will lead to subordinates and others in the organization not performing well, and it can bring about psychological distress [6–9].

The development and assessment of safety leadership should be expanded to systematically accommodate the efforts that companies must achieve to have a positive impact on workplace safety [10]. Errors in defining safety leadership have contributed to the inadequacy of the preparation of many firms' safety measures, which has, in turn, led to an elimination of the power of their overall safety programs and had negative effects on injury rates. All of this hinders these companies' success [11]. This study will examine the components of safety leadership with recognition of the importance of noting its relationship to the purpose of implementing and measuring safety leadership efforts.

2. Methods

This study was a narrative literature review aiming to identify the components of safety leadership in the mining industry. The means used to search for the topic of safety were commonly used literature databases, ScienceDirect

(www.sciencedirect.com). Queries returned only those articles published between 2010 and 2017, and they were limited to open access journals. The search was conducted using a combination of the following keywords: safety leadership, safety culture, mines, and coal mines. The steps the author followed were: identifying the topic, searching for and finding articles in the literature, evaluating the articles, reading articles critically, analyzing them, synthesizing their data, and writing and presenting the literature review.



3. Results

By using a combination of the aforementioned keywords, many articles were initially returned, but only 26 were truly relevant to this topic. A summary of the components of safety leadership can be found in Table 1. The results revealed only two among all of the publications that focus on safety leadership addressed the mining industry; most researchers focus on several areas, such as construction, health, laboratories, and workplaces in general.

Leadership value is among each person's core personality traits, it affects the choices people make, who they choose to believe, and how they use their time and energy. The leadership value is also a basic objective and part of the culture that has developed as an essential aspect for the management of health and safety in the workplace [12]. Safety leadership is "the process of interaction between leaders and followers, through which leaders [can] exert their influence on followers to achieve organizational safety goals under the circumstances of organizational and individual factors" (p. 308 [13]). The main actors in the leadership model are organizational actors and individuals. The quality of this leadership affects the organizational climate and can have a significant effect on the organization's performance. Organizations that create comfortable situations stimulate potential and current employees to achieve their best performance [13]. This research tries to illustrate the concept of safety leadership based on the analysis of literature that has been done (see Figure 1).

3.1. Safety coaching

Safety coaching should be seen as a process designed to help workers develop workplace safety behaviors. Such coaching is a technique that involves interpersonal interaction and the manipulation of working conditions to motivate behavior and safety habits. Most accidents happen due to workers' unsafe actions, a lack of awareness about an unsafe behavior, poor attitudes among workers, a lack of worker training and knowledge, and poor work practices. This is also one of the barriers to the effective implementation of safety management system in developing countries [14, 15].

Appropriate training is not only related to the implementation of an occupational health and safety program but also serves as a place for workers to acquire the knowledge and capabilities needed for their duties and provide information on potential hazards in the workplace and how to address emergencies.

Managers should be able to identify training needs and to facilitate workers' access to safety training. Xuesheng's research about relationship between safety leadership and safety climate, performed with structural equation model (SEM) analysis shows that a commitment to safety has a positive impact on safety training (path coefficient = 0.61) [4, 16]. The failure to identify training needs remains a problem in many workplaces [17–20]. Unsafe behavior is closely related to workers' psychological condition; therefore, psychological training, such as how to manage anxiety, is also important to implement. When workers' psychological states are improved, it is the first step to reducing the number of accidents [21].

TABLE 1: Summary of safety leadership component.

Author	Year	Safety leadership component
Xuesheng dan Wenbiao [4]	2012	Active management, safety motivation, and safety monitor
Kim dan Gausdal [10]	2017	Lower level management; Communicating, Caring and supporting, Controlling and enforcing, Participative involvement, Middle level management; Empowering, Monitoring, Informing, Coordinating Top level management; Enabling, safety concern, establishing and structuring, inspiring and facilitating
Wu, et al [13]	2007	Safety coaching, safety caring and safety controlling
Daniel [11]	2015	Discipline; personal discipline with safety, applying discipline to others, providing consequences Values; belief in safety and importance, values of fairness, integrity, sharing values, Vision; project goals and vision, safety expectations, mapping the desired state, Honesty; not masking safety information, being transparent, following through with commitment Engagement; building relationship with others, communication, field interactions, Demonstration; following thorough safety standards, participating in toolboxes, wearing PPE
Mazdai and Mohammadi [30]	2012	Practical leadership; management by walking around, Rational leadership; management by objective, Emotional leadership; management with emotions Spiritual leadership; management by meaning
Skeepers and Mbohwa [12]	2015	Safety vision, safety culture, and safety communication
Lu and Yang [31]	2010	Safety motivation, safety policy and safety concern
Zhang et al. [32]	2017	Safety management commitment, safety communication with feedback, safety training, safety policy and safety incentive
Read et al. [25]	2011	Creating, Achievement oriented, Relationship based, Endeavour And Sustainably
Malyjurek	2015	Leader traits; skills, ability, behavior, knowledge and consciousness Group member's traits; capabilities, involvement in activities, respect to the leader, willingness to collaboration, Relationship between a leader and group members
Nelson et al. [33]	2014	Reference to one's self-awareness Balance processing information Internalized moral perspective Ethical aspect of decision-making Interact with others
Cooper [34]	2015	Caring and controlling
Ibrahim et al. [35]	2017	Leader, follower and relational interactions
Griffin and Hu [36]	2013	Safety inspiring, safety monitoring and safety learning
Pilbeam et al. [37]	2016	Constructive leadership, corrective leadership and laissez-faire leadership
Corcoles et al. [38]	2013	Leading by example, participative decision making, coaching, informing and showing concern/interacting with employee
Bass	1985	Idealized influence, intellectual stimulation, inspirational motivation, and individualized consideration

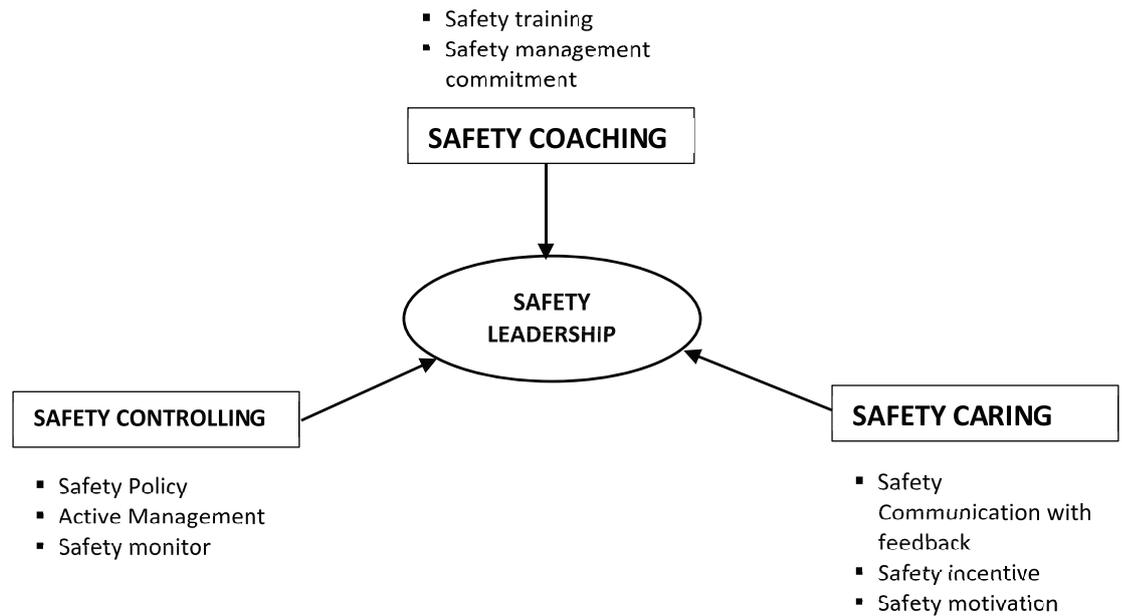


Figure 1: Safety leadership component in coal mine.

The role of senior management is also crucial for the active demonstration of a commitment to safety. Managers can use their positions to provide leadership and employ resources for safety strategy development [20]. Based on the Safety Culture Maturity Model, we know that, to improve the safety culture among workers, company should begin with the most basic element: the development of management commitment to safety [18]. Most Indonesian coal mining companies do not assign senior managers a role in their health and safety efforts, but the effectiveness of health and safety performance inevitably starts with the top management. Senior managers are doubly responsible, accountable for the health and safety of workers individually and as a whole. Managers should change their attitudes and increase their commitment to improving safety levels and come to regard safety as equally important as other aspects of the company. For example, to prove the management’s commitment to safety, it could develop safety policies and provide all required resources such as cost for safety program and other equipment that will allow workers to be safely. Management commitment to safety is the key element, and lack of it can lead to system failure and difficulty in creating a positive safety culture.

3.2. Safety caring

Sharing definite information and communication about safety are two important factors that influence and support the decisions related to safety leadership [22]. A

good leader is one who can coach subordinates' behaviors to facilitate a positive interpersonal climate wherein the subordinates feel comfortable acknowledging and analyzing the mistakes they make to prevent them from happening again. Based on the results of his research on communication error analysis, leadership coaching tends as having a strong direct relationship to communication; the researchers suggests that leaders must have good interpersonal skills, in order to predict workers' involvement in safe work processes [23]. Leaders should be able to communicate with workers consistently and clearly when conveying standards, explaining what limitations must be observed; process safety objectives; undertake safety-oriented activities and note achievements; and develop a safety issue reporting system to ensure that workers understand what is being asked of them. Through communication, leaders must also convey to workers the organization's safety expectations and consequences for failure to uphold them [24, 25].

Effective communication is the most important component for shaping workers' perceptions of a safe work environment, but until recently it has only received limited attention. Leaders face several challenges in realizing effective communication, such as defining the diverse workplace context and conflicts of goals. The diverse workplace context is closely related to the level of visibility of supervisors to workers and refers to which areas of work cannot be directly supervised. Levels of visibility have a significant impact on safety-related performance. It has long been known that safety is often a source of conflict, given firms' demands for profit (efficiency). The conflict between profitability and safety is rooted in the fact that both are important goals, but they often compete for limited resources [26].

Safety motivation related to the extent to which a senior manager creates a motivation system to encourage workers' safe behaviors. Motivated employees tend to focus their energies on improving productivity, quality and the success of change implementation, safety issues at work, and relationships between employees and management [4, 12]. Motivating workers can be achieved by understanding their behaviors. There are three keys to management that need to be considered when trying to motivate workers. First, determine what drives them to engage in certain behaviors. Second, understand the current workers' behavior and its tendency. Third is understanding how one's behavior can be continuously maintained or implemented [16].

In addition to good communication and motivating workers to always work safely, another innovative approach that can be used to prevent accidents and promote a safe workplace environment is motivating workers via allowances and incentives. Providing

incentives in the form of financial or other types of rewards can help to stimulate the workers' behaviors and encourage them to become involved in safety programs. This, in turn, works to ensure the safety of the company's production and achieve the maximum safety of workers at a minimum cost. To achieve this goal, one must first understand what factors affect safety. The incentives' subjects are the firm's owner/operator and management team, while the objects are the laborers.

The core of an incentive program should be aimed at mobilizing workers' enthusiasm and awareness. When designing safety incentive, managers must consider a combination between the incentives' subjects and objectives. For workers, the incentive should not appeal only at the individual level, but also reflects the limits of workers' ability, and the payment should not only meet their physical needs. Shu developed a model of a complex incentive mechanism that implies incentives based on the position and achievements, this model believe that it will stimulate workers' performance because the model itself is structured by considering the needs theory, expectancy theory, equity theory (see Figure 2) [5, 27].

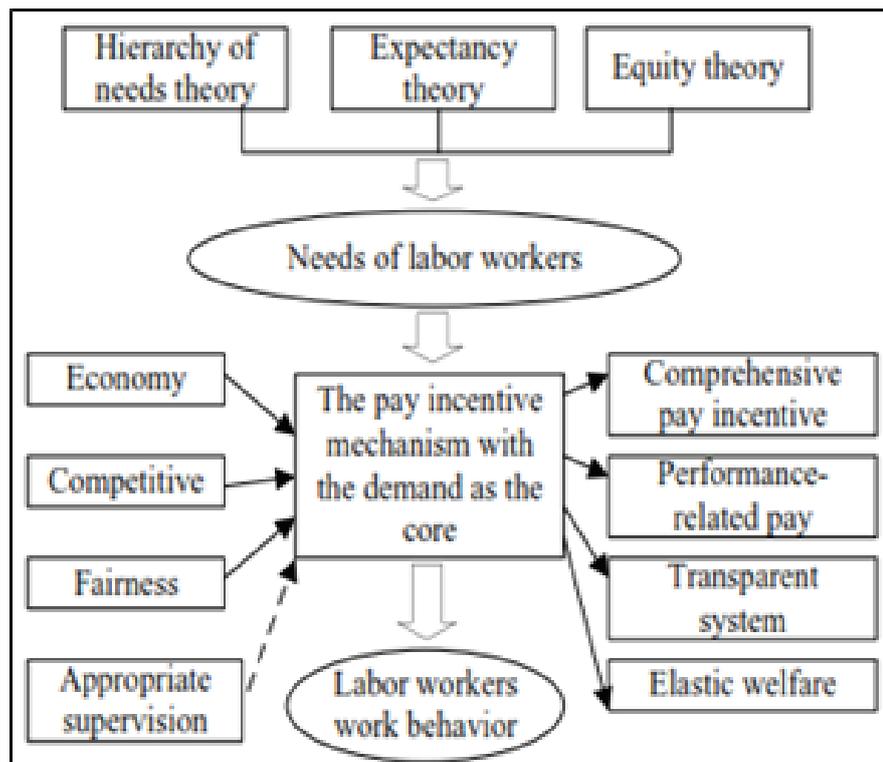


Figure 2: Model of incentive payment mechanism.

3.3. Safety controlling

In any effort to protect workers, it is imperative for companies to develop a safety policy. Each company must develop the goals of its safety program and assign responsibility for its implementation. The policy statement should have at least four basic points, that is (i) the safety of workers and the public, (ii) focus on safety, rather than expediency, (iii) all of the efforts should involve managers, supervisors, and workers in developing and implementing safety procedures, and (iv) should meet all safety regulations. Research conducted by Akpan of organization in Africa found a significant relationship between the compliance of health and safety policies with sustainable economic growth and organizational development. Management should involve workers in the policy-making process, and the policy should be signed-off on by stakeholders as an indication of their commitment to safety. Maintaining an OHS policy is believed to reduce the rate of accidents and incidents, the prevalence of health and safety hazards, and the costs associated with them. Furthermore, companies with safety policies are more likely to have a good corporate image, attracting potential investors and customers while also improving their competitive position. In short, the benefits of a safety policy are not only reaped by company as a whole, but also affect workers. When we support workers' safety awareness, it ultimately contributes to improving the company's performance, quality, and output efficiency [28]. The implementation of safety programs or other activities in a safety management system must be initiated or supported by top management, as without management support, safety is just another issue.

Changing workers' mindsets toward safety is an important and effective way to address safety issues. First-line supervisors and managers are the main actors who are well-versed in mine operations and they serve as operational sources of information. They can tell whether operations are in compliance with safety standards and/or what actions might be in conflict with current mine operations. Due to the mines' inherently dangerous work environment, the mining industry has adopted a quasi-military system, in terms of its command and control management style. There are four important considerations that need to be improved to reduce the potential for human error through management and supervisors: is the clarity of roles, responsibilities and authority; adequate training, support; and active monitoring [29].

Safety monitoring measures the extent to which senior managers are able to create a clear mission, chain of responsibility, and objectives to establish the standards of behavior and actions that workers must follow. This also creates a safety system that

can improve workers' safety behaviors. Sustainable safety monitoring is needed to improve workplaces' safety cultures by developing key performance indicators. Regular monitoring and evaluation is also needed to identify opportunities for improvement. Then, the results need to be passed on to all related personnel. Monitoring can ensure that a safety program is running effectively; detect potential problems early, before they become entrenched; and make sure all the processes that are running properly. Measuring the success of such a program is an important aspect of system feedback, and in its absence, there will be many opportunities for missed improvement. This, in turn, can lead to worse safety performance, rendering the efforts to prevent accidents worthless [4, 24].

4. Conclusion

Safety leadership includes a unique set of variable that differentiate it from other leadership models because it is created in response to the operating environment. This study aimed to analyze the components of safety leadership via an effective literature review. The leadership related to safety components has both direct and indirect effects on safety performance, so in further studies, the authors will seek the connection of these components to safety leadership in the workplace.

Conflict of Interest

The authors declare that there is no competing interest.

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