

Original Paper

Safety Culture Literacy Education in the Context of Industrial Transformation

Xingjian Yang¹ & Jinxing Gu¹

¹ Hainan Vocational University of Science and Technology, Haikou, China, 57100

Received: January 18, 2026

Accepted: March 29, 2026

Online Published: May 6, 2026

doi:10.22158/wjeh.v8n2p63

URL: <http://dx.doi.org/10.22158/wjeh.v8n2p63>

Abstract

China's industrial transformation is currently in a crucial period marked by structural upgrading and the shift of growth drivers. In this context, industrial safety risks have gradually exhibited new features including complexity, concealment, and chain conduction effects. Focusing on the background of industrial transformation, this paper clarifies the core connotation and practical value of safety culture literacy education, analyzes the realistic dilemmas such as cognitive deviation, system lag, and practice disconnection, and puts forward implementation paths that fit industrial transformation from four aspects: concept remodeling, system construction, path innovation, and guarantee strengthening. The research can provide theoretical support and practical reference for strengthening the industrial safety barrier and advancing high-quality industrial development.

Keywords

industrial transformation, safety culture literacy, safety education, risk prevention and control

1. Introduction

Industrialization serves as the core driving force for national modernization. After decades of high-speed development, China has built a complete, independent, and comprehensive industrial system and has become the world's largest manufacturing country. At present, China's industrialization has entered a critical stage of mid-to-late transformation. The traditional extensive production model is gradually replaced by a new industrialization model featured by technology intensification, intelligent integration, and green low-carbon development. Industrial structure adjustment, technological iteration, and production mode reform advance in parallel.

While industrial transformation injects new momentum into economic growth, it also brings new types of safety risks. On the one hand, overlapping risks still exist in traditional high-risk fields such as chemical industry, mining, and construction; problems such as aging equipment, outdated technology,

and loose management have not been completely solved. On the other hand, new technologies and applications including artificial intelligence, industrial Internet, and intelligent manufacturing have triggered emerging risks such as data security, algorithm out-of-control, and human-machine cooperation errors, which significantly enhance the suddenness, destructiveness, and domino effect of safety accidents.

Safety is the basic premise and bottom line of industrial development. The deeper the industrial transformation advances, the more solid safety guarantee is needed. In recent years, China's industrial safety production situation has maintained overall stability and continued to improve. However, occasional major and serious accidents have exposed deep-seated problems in some enterprises, such as attaching more importance to production than safety, weak safety awareness among employees, insufficient safety skills, and lack of sound safety culture.

Practice shows that technical prevention and institutional constraints can reduce accident probability, but cannot fundamentally eliminate human errors. Only by improving the safety culture literacy of all employees and promoting the internalization of safety concepts and externalization of behaviors can we realize the fundamental transformation from passive safety to active safety, and from institutional restriction to cultural consciousness.

Safety culture literacy education is the core way to shape safety culture and improve individual safety literacy. In essence, it aims to shape correct safety values, popularize safety knowledge, enhance operational skills, and standardize on-the-job behaviors through systematic education and guidance. Under the background of industrial transformation, strengthening safety culture literacy education is not only an urgent need to prevent and resolve new industrial safety risks and curb major accidents, but also an inevitable requirement to improve the overall quality of industrial workers and boost the modernization of industrial governance. It is also an important measure to adhere to the people-first and life-first principle and protect people's lives and property.

On this basis, this paper focuses on the internal connection between industrial transformation and safety culture literacy education, systematically analyzes the realistic dilemmas and optimization paths of education implementation, and provides support for industrial safety development in the new era.

2. Core Connotations and Practical Value of Safety Culture Literacy Education

2.1 Core Connotations

Safety culture literacy is the concrete expression of safety culture at the individual level, representing the organic integration of cognition, knowledge, skills, behavior, and values. In the context of industrial transformation, safety culture literacy education is an extension and upgrading of traditional safety education. Based on the risk characteristics of new-type industrialization, it takes workers in the whole industrial chain as the target group, and focuses on cultivating intrinsic safety awareness, systematic safety thinking, and comprehensive safety capability.

1. Safety cognitive literacy refers to the ability to identify safety risks in industrial transformation and

the recognition degree of the safety-first concept. It requires individuals to clarify the safety boundary and responsible subjects in technology application and production operation, and abandon outdated production and development concepts.

2. Safety knowledge literacy covers safety production laws and regulations, industry standards and norms, and basic safety knowledge applicable to new industrial scenarios, so as to adapt to the new safety management requirements brought by industrial upgrading.

3. Safety skill literacy requires employees to master hazard identification, emergency response, self-rescue, and mutual-rescue skills proficiently, so as to minimize casualties and property losses caused by accidents.

4. Safety behavior literacy encourages employees to consciously abide by rules and take the initiative to participate in safety management, so as to realize the in-depth transformation from being asked to be safe to willing to be safe.

2.2 Practical Value

2.2.1 Consolidate the Industrial Safety Barrier and Prevent Emerging Risks

The complexity and concealment of safety risks in the process of industrial transformation determine that intrinsic safety is difficult to achieve only by technical prevention or institutional restriction. Unsafe human behavior is an important cause of accidents. Strengthening safety culture construction can regulate employees' behaviors at the ideological level (Xi, 2022). Building a four-in-one prevention and control system integrating human defense, physical defense, technical defense, and cultural defense is an inevitable choice for industrial safety production governance in the new era, and also an important direction of modern enterprise safety culture construction.

2.2.2 Empower High-quality Industrial Development and Consolidate the Transformation Foundation

The core goal of industrial transformation is to realize the organic unity of industrial development quality, efficiency, and safety. Good safety culture literacy can effectively reduce the accident rate, reduce abnormal economic losses of enterprises, and create a stable and orderly production environment. Industrial workers with comprehensive safety ability can adapt to the new requirements of intelligent and green production, laying a solid talent foundation for industrial upgrading and long-term development.

2.2.3 Promote the Modernization of Industrial Governance and Improve Safety Management Efficiency

The campaign-style and penalty-oriented traditional safety management model can no longer adapt to the intelligent and integrated modern industrial production system. Taking safety culture literacy education as an important starting point, moving the safety management gateway forward and shifting from post-accident disposal to pre-accident prevention will help form a modern safety governance pattern featuring full participation, joint construction, and shared governance, so as to comprehensively improve the refinement level of industrial safety governance.

2.2.4 Practice the People-oriented Principle and Protect Workers' Rights and Interests

Workers are the core subjects of industrialization, and protecting their lives and health is the

bottom-line responsibility of enterprise development. The wide application of new processes, new equipment, and new models has continuously raised the safety operation threshold of various posts. Regular safety literacy education can effectively make up for workers' knowledge gaps, balance the needs of industrial upgrading and people's safe development, and reflect the people-centered development core.

3. Practical Dilemmas of Safety Culture Literacy Education

3.1 Cognitive Level: Insufficient Attention and Backward Concepts

Some industrial enterprises still hold the extensive development thinking and regard safety education as an additional cost. They pursue production efficiency and economic benefits unilaterally, lack sufficient understanding of the long-term value of safety culture literacy education, and generally have the biased cognition of emphasizing operation over safety and emphasizing system over culture. At the grass-roots level, employees generally have fluke mindsets and resistance to regular safety learning, and their sense of safety awe is weak.

At the social level, the coverage of industrial safety culture publicity is limited, and the social safety consensus matching industrial transformation has not yet been formed, leading to a relatively weak overall safety culture atmosphere.

3.2 System Level: Impermanent Framework and Outdated Content

At present, safety literacy education in China's industrial field lacks unified and systematic top-level design. The multi-stakeholder coordination mechanism among government, enterprises, vocational colleges, and social organizations is fragmented, and the responsibility boundary is vague. Under the background of digital and intelligent transformation, new production processes and intelligent equipment are widely used, deriving many new safety risks. However, the existing safety education content is updated slowly and has a narrow coverage, which is difficult to match the actual needs of industrial iteration and upgrading (Gu, 2026).

The safety education curriculum system of vocational colleges is not perfect, and safety elements are not fully integrated into courses, which makes it difficult to meet the practical needs of cultivating students' safety literacy and supporting their future career development in the new era (Yang & Lan, 2023).

3.3 Practice Level: Monotonous Forms and Insufficient Effectiveness

Safety education in most enterprises still stays in the traditional indoctrination mode, such as document reading, slogan posting, and centralized lectures. These forms are rigid and the content is boring, which is difficult to stimulate the initiative of learners. The proportion of practical teaching methods such as scene simulation, emergency drill, and on-site operation is relatively low, resulting in the disconnection between theory and practice. As a result, employees' practical abilities in hazard identification and emergency response are difficult to improve effectively.

At present, safety education in many manufacturing enterprises remains superficial, carried out in

stages and lacking normalization, which makes it difficult to realize the long-term cultivation of safety literacy (He & Yi, 2021).

3.4 Guarantee Level: Insufficient Resources and Incomplete Mechanism

Safety literacy education generally faces problems such as insufficient funding, shortage of professional teachers, and inadequate practical training resources. Most enterprises lack compound teachers who have both industrial professional technology and safety teaching ability, leading to serious homogenization of education content.

At the same time, the assessment, evaluation, incentive, and restraint mechanisms are not perfect. The effect of safety education is not included in the enterprise assessment and employee performance appraisal, and the incentive and restraint intensity is insufficient. As a result, safety education tends to be formalized and cannot form rigid constraints, which restricts the effective implementation of safety culture construction.

4. Optimization Pathways for Safety Culture Literacy Education

4.1 Concept Remodeling: Strengthen Ideological Guidance and Establish Correct Safety Values

The government should incorporate safety culture construction into the overall planning of regional industrial transformation and development. Relying on policy guidance and supervision, it should correct the short-sighted behavior of enterprises that emphasize benefits over safety, and guide enterprises to carry out safety culture cultivation regularly with industry norms and institutional standards.

Enterprises should strictly abide by the industry specifications of safety culture construction, establish correct safety production values, and systematically and normatively promote the cultivation and implementation of internal safety culture. Enterprises need to transform management thinking and integrate safety culture into the core content of corporate culture construction. Through pre-shift safety meetings, case warning education, safety culture activities and other forms, the safety responsibility awareness of all employees should be strengthened.

For example, Shandong Jiuyang Group, a traditional metallurgical enterprise, had prominent problems such as solidified old operation habits, weak employee safety awareness, and insufficient risk prevention and control in the operation of new metallurgical equipment in the process of capacity upgrading and intelligent equipment transformation, with frequent potential occupational injury risks.

To adapt to the new safety production standards under industrial transformation, the enterprise abandoned the previous management model that emphasized punishment over education. It cooperated with safety training experts to formulate a special improvement plan for safety culture literacy. Focusing on high-temperature and high-pressure metallurgical operation, intelligent smelting equipment operation, post risk prediction and other key fields, it carried out regular laws and regulations training, hazard identification practical operation, accident case review and immersive education.

Through regular and sustained safety literacy cultivation, employees completely gave up empirical unsafe operation habits and took the initiative to carry out post safety self-inspection and hidden danger rectification reporting. The safety operation compliance rate increased significantly, and the enterprise successfully realized the transformation from passive safety control to active safety practice. This case shows that safety culture literacy education is a fundamental strategy for traditional industrial enterprises to realize transformation and upgrading and prevent safety accidents (Zhang, 2024).

4.2 System Construction: Improve the Education Framework and Realize Full-chain Coverage

A diversified education system of government leadership, enterprise responsibility, college support, and social participation should be built to clarify the responsibilities of all parties and form educational synergy. The content system of safety education should be updated and optimized according to the development trend of industrial transformation.

Cutting-edge contents such as intelligent equipment operation safety, industrial data protection, and green production safety should be added to make up for the shortcomings of safety education in new industrial scenarios. A full-chain education model should be constructed connecting primary and secondary school safety enlightenment, vocational college professional safety education, enterprise regular post training, and industry lifelong learning. Through curriculum development, classroom integration, practical teaching, hands-on training and other carriers, the comprehensive safety literacy of workers should be systematically cultivated.

For example, Chengdu Industrial Vocational Technical College closely responds to the urgent needs of talent training under industrial transformation. Based on the engineering vocational education orientation, the college abandoned the previous education model that emphasized technical skills while ignoring safety literacy. It deeply integrates industrial heritage safety development history, national major industrial project safety operation and maintenance cases, and industrial safety production ideological and political connotation into daily teaching.

Thus, a three-in-one safety culture literacy education system of classroom teaching, venue training, and front-line practice has been constructed. Focusing on emerging industrial majors such as intelligent manufacturing and equipment manufacturing, it aims at the pain points such as weak safety cognition of the new generation of industrial workers and unfamiliarity with the safety operation specifications of new intelligent equipment. The college regularly carries out industrial safety emergency drills and post safety risk identification practical training, enabling students to establish modern industrial safety thinking at school. This strengthens the safety culture foundation of future industrial talents from the source and helps solve the safety literacy fault problem between old and new employees in industrial transformation (Xinhuanet, 2026).

4.3 Path Innovation: Enrich Education Forms and Improve Education Effectiveness

Break through the limitations of traditional cramming teaching, introduce VR virtual simulation, accident scenario restoration, hazard identification skills competition and other diversified teaching modes to enhance the immersion and practicality of safety education.

Carry out normalized emergency drills for fire, leakage, equipment failure and other scenarios to effectively improve employees' emergency response, self-rescue and mutual-rescue capabilities. Strengthen employees' sense of safety awe through immersive education. Relying on online learning platforms, develop micro-courses, short videos, online question banks and other digital learning resources to support fragmented, independent and regular learning. Combined with the actual production operation of enterprises, integrate safety culture into the whole process of daily management, team construction assessment, and post operation, and consolidate the effect of safety education through a long-term management mechanism.

For example, relying on digital and industrial transformation, Shenmu coal chemical enterprises abandoned the traditional single safety preaching mode and built an HSE365 digital safety culture education platform suitable for the high-temperature, high-pressure, flammable and explosive high-risk production characteristics of the chemical industry. Through visual animation explanation, 3D restoration of accident cases, post safety responsibility precise matching and other digital forms, the platform carries out regular safety culture literacy education for all employees.

It makes up for the shortcomings of traditional safety education such as single form, weak implementation and incomplete coverage. Relying on the platform, the enterprise integrates safety culture into the whole process of daily team management, pre-job safety education and regular literacy assessment. It guides employees to accurately grasp the safety specifications of new chemical processes and the key points of safe operation and maintenance of digital equipment, so that safety concepts are internalized in the heart and operation specifications are externalized in the line.

After years of practice, the enterprise has not had any major or serious safety production accidents. Through the cultivation of safety culture literacy, it has consolidated the safety production bottom line in the process of digital and industrial transformation, and provided a mature practical model for the safety culture construction of high-risk industries in the transformation period (Wang & Liu, 2025).

4.4 Strengthen Safeguards: Improve the Support System and Consolidate the Education Foundation

Increase special investment in safety education and improve the construction of hardware facilities such as safety training venues, simulation equipment and warning education bases. Build a compound teaching team composed of safety management experts, enterprise technical backbones and college professional teachers to improve the quality of safety education through professional teaching support.

Establish a closed-loop assessment mechanism, incorporate safety culture literacy learning effect and safety behavior performance into enterprise credit evaluation, employee performance assessment and job promotion assessment, and implement the safety one-vote veto system. Improve the reward and punishment mechanism, commend and reward departments and individuals with outstanding achievements in safety culture construction, and force the implementation of safety responsibilities through institutional constraints, so as to continuously consolidate the foundation of enterprise safety management.

5. Conclusion

China's industrialization has entered a critical stage of in-depth transformation toward intelligence, green and high-end. The transformation of old and new production modes and the wide application of new technologies have made industrial safety risks present new characteristics of multiple superposition, and the basic supporting role of safety culture literacy has become increasingly prominent.

While artificial intelligence empowers industrial upgrading, emerging hazards such as algorithm risk, human-machine cooperation risk, network and data security risk are increasing, putting forward higher requirements for the safety literacy of all employees. Safety culture literacy education is an important way to resolve emerging safety risks, prevent safety production accidents and promote the modernization of industrial governance. It is also the core support for the coordinated promotion of high-quality industrial development and safety production.

At present, industrial safety culture literacy education still faces many practical dilemmas such as cognitive deviation, imperfect system, rigid education form and weak guarantee. In response, it is necessary to closely follow the characteristics of industrial transformation, start from concept remodeling, build a collaborative and systematic education system, innovate education modes and practical carriers, and improve multiple guarantee mechanisms such as funding, teachers and assessment.

In this way, the safety cognition, safety knowledge, practical skills and behavior literacy of industrial workers can be improved in an all-round way. The shaping of safety culture cannot be achieved overnight, and the improvement of safety literacy needs continuous long-term efforts. Only in strict accordance with the requirements of industrial safety standards, normalize the promotion of safety culture construction and literacy education, and deeply integrate safety concepts into the whole process, all posts and all personnel of industrial production, can we prevent safety risks from the source, consolidate the foundation of industrial safety production, and build a solid safety barrier for China's high-quality industrial transformation and the stable and healthy development of the real economy.

References

- Gu, J. X. (2026). Challenges and Responses of Safety Culture Literacy Education in the Era of Artificial Intelligence. *China Industry News*, 2026(3), 17-20.
- He, Y. F., & Yi, J. (2021). Practical Exploration of Safety Culture Construction in Production-Oriented Enterprises. *Construction & Design for Engineering*, 2021(3), 252-254.
- Wang, J., & Liu, Y. (2025). Application Practice of the HSE Digital Platform in Safety Culture Publicity and Education in High-Risk Coal Chemical Enterprises. *Coal Chemical Industry*, 53(01), 78-81.
- Xi, Z. Y., & Lu, R. (2022). Reflections and Practices on Enterprise Safety Culture Construction. *Industrial Technology Innovation*, 4(2), 111-113.

- Xinhuanet. (2026). *Continuing Sichuan's Industrial Heritage and Consolidating the Cornerstone of National Security: Chengdu Industrial Vocational Technical College's Innovative Practice in National Security Education* [EB/OL]. (2026-04-20) [2026-04-29].
- Yang, P. P., & Lan, W. X. (2023). Practical Research on the Construction of "Curriculum Safety" in Vocational Colleges Based on Safety Ethics. *Education and Teaching Forum*, 2023(24), 176-179.
- Zhang, L. (2024). Research on the Reshaping of Employees' Safety Culture during Intelligent Technological Transformation in Traditional Heavy Industry Enterprises. *Industrial Safety and Environmental Protection*, 50(05), 89-92.