

Research on the Sinicization of Germany's Vocational Education Safety Genes and the Localization Path of Safety Education in Chinese Higher Vocational Colleges

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Abstract: The German Dual Vocational Training System (Duales System) is globally renowned for its efficiency in cultivating a high-skilled workforce. While its structural and pedagogical strengths are widely studied, a critical yet under-examined facet is its intrinsic embedding of safety competence, which this paper conceptualizes as its "Safety Genes." These genes comprise a complex allele of legal frameworks, corporate responsibility, and a pedagogical culture that normalizes safety as a core professional virtue. This paper employs a historical-comparative analysis to deconstruct these elements within the German context, contrasting them with the evolving, yet often compliance-driven, safety education paradigm in Chinese Higher Vocational Education (HVE). It identifies a fundamental dissonance: China's approach often treats safety as a standalone knowledge set, whereas the German system integrates it as a habitual practice within the workplace learning community. Moving beyond mere comparison, this study proposes a critical localization framework for the Chinese context. It argues against simplistic transplantation and advocates for a synergistic model that hybridizes the rigorous, standard-based German approach with the scalability and digital adaptability of China's HVE system. The proposed pathways include the development of "Smart Safety Apprenticeships," the creation of industry-specific, tripartite safety competency standards, and the repositioning of safety from a technical skill to a foundational element of professional identity.

Keywords: Dual Vocational Training, Safety Education, Chinese Higher Vocational Education, Localization, Professional Identity

1. Introduction

The international discourse on Vocational Education and Training (VET) persistently highlights the German Dual System as a benchmark for excellence ^[1]. Its success is frequently attributed to the close integration of theoretical learning in vocational schools (Berufsschulen) and practical training in host companies. However, the system's profound effectiveness in instilling a robust and intrinsic culture of workplace safety remains a less illuminated achievement. In China, as the Higher Vocational Education (HVE) sector expands rapidly to meet the demands of "Made in China 2025," workplace safety has emerged as a critical concern ^[2]. Despite regulatory efforts, safety education often remains fragmented, theoretical, and decoupled from the actual professional socialisation process, leading to a gap between knowledge acquisition and behavioral internalization.

This paper posits that the German system's success in safety cultivation is not a peripheral benefit but is encoded in its very DNA—its "Safety Genes." This concept refers to the interconnected and mutually reinforcing elements of law, pedagogy, and corporate culture that make safety an indispensable and habitual component of a skilled worker's professional identity ^[3]. The central research question this paper addresses is: What constitutes the "Safety Genes" of the German Dual System, and through what feasible pathways can they be critically localized to enhance the efficacy and depth of safety education within China's unique HVE landscape?

Through a critical historical and comparative analysis, this study will deconstruct the German model and propose a move beyond policy imitation towards a sophisticated, context-sensitive localization that fosters a genuine safety ethos.

2. Theoretical Framework: Deconstructing the "Safety Genes"

The concept of "Safety Genes" can be understood through the synthesis of two theoretical lenses, which provide the connotative depth for our analysis.

2.1 *Situated Learning and Legitimate Peripheral Participation*

This theory posits that learning is fundamentally a social process of participation in a "community of practice"^[4]. In the Dual System, the apprentice enters the workplace community and learns safety not as abstract rules, but as embodied, socially negotiated practices from old-timers (master craftsmen). Safety becomes part of the shared repertoire of the community. The gradual movement from peripheral to full participation is scaffolded by safety practices, making them inherent to belonging and competence.

2.2 *Professional Virtue and Identity Formation*

Building on situated learning, Billett argues that vocational learning is not merely skill acquisition but the development of a professional identity [3]. In the German context, "safety" is cultivated as a core professional virtue—a non-negotiable attribute of being a *Fachkraft* (skilled professional). It is integrated into one's work identity, shaping how a professional perceives their role and responsibilities. This moves safety from an external regulation to an internal moral and professional compass.

These frameworks allow us to see safety not as a curriculum module, but as a lived experience and a foundational component of becoming a professional. The "genes" are the mechanisms that enable this situated development of a safety-oriented professional identity.

3. The German "Safety Genes": An Anatomical View

The robustness of safety in the German Dual System stems from a tripartite, co-regulatory structure where each "gene" reinforces the others.

3.1 *The Legal and Institutional Allele: A Mandated Tripartite Structure*

Safety is not optional; it is legally mandated, creating a robust institutional framework. The German Vocational Training Act (*Berufsbildungsgesetz*, BBiG) and the jurisdiction of statutory accident insurance institutions (*Berufsgenossenschaften*) create a binding "ecosystem of safety" [5]. Companies are legally obligated to provide a safe learning environment, and trainers are certified, ensuring they possess the pedagogical and safety competence to guide apprentices. This creates a system of shared accountability between the state (which sets standards), the company (which implements them), and the social partners (unions and employer associations which help shape them).

3.2 *The Corporate Social Responsibility Allele: "Safety as Productivity"*

For German *Ausbildungsbetriebe* (training companies), investing in safety is synonymous with investing in quality and long-term productivity. A safe worker is a reliable, skilled, and efficient worker, which reduces costs associated with accidents and turnover. This economic rationality, combined with a strong tradition of *Sozialpartnerschaft* (social partnership between employers and unions), embeds safety into the corporate ethos. It is in the company's direct self-interest, both economically and reputationally, to cultivate safe work habits from the first day of apprenticeship, treating safety as a capital good rather than a regulatory cost.

3.3 *The Pedagogical and Curricular Allele: Integration and Habituation*

The *Ausbildungsrahmenplan* (framework training plan) for each recognized occupation intricately weaves safety competencies into every practical learning objective. Safety is not a separate subject; it is the precondition for performing any task. This "hidden curriculum" of safety is constantly reinforced through daily practice, immediate feedback from *Meister* (master craftsmen), and the gradual entrustment of more complex and responsible tasks, all within a safety-conscious environment^[4]. This process of habituation, supported by legitimate peripheral participation, transforms safety knowledge into unconscious competence.

4. The Chinese Context: The Imperative for Localization

In contrast, safety education in Chinese HVE, while improving, faces distinct challenges rooted in its developmental trajectory.

4.1 Theory-Practice Divide

Safety is often taught in classroom settings through lectures and textbooks, detached from the authentic context of the workshop or potential future workplace^[5]. This leads to "inert knowledge" that students fail to activate in practical situations.

4.2 Compliance over Culture

The focus is frequently on passing safety exams and adhering to top-down regulations, rather than fostering an internalized safety ethos. The assessment-driven approach prioritizes rote memorization over the development of a safety identity as envisioned by Billett.

4.3 Variable Enterprise Engagement

The involvement and commitment of industry partners in safety training can be inconsistent, lacking the deep-seated cultural and legal foundations of the German model^[5]. Companies may see training as a source of cheap labor rather than a long-term investment in human capital.

China's "Double High-Level Plan" and the promotion of a "modern apprenticeship system" provide a timely policy window for integrating these insights, moving towards a more integrated model.

5. Pathways to Critical Localization: A Hybrid Model

Direct copying is destined to fail due to divergent cultural and institutional contexts. Successful localization requires creative adaptation, or "hybridization."

5.1 Develop "Smart Safety Apprenticeships"

Using China's advantages in digital technology, through VR and AR simulation technology, an immersive risk-free environment is created for dangerous operation exercises. This can bridge the theory-practice gap by providing a simulated "situated learning" experience before students enter physical workshops, aligning with Lave & Wenger's emphasis on contextual learning while mitigating initial risks.

5.2 Co-construct Tripartite Safety Competency Standards

The government, HVE institutions, and leading industry associations should collaboratively develop detailed, occupation-specific safety competency standards. These should go beyond knowledge to include observable behaviors and attitudes, integrated directly into the national professional standards. This mirrors the German tripartite model and creates a shared framework for accountability, addressing the current engagement gap.

5.3 Reframe Safety as Professional Virtue

Curriculum reform should explicitly position safety as a cornerstone of professional identity and craftsmanship (Gongjiang Jingshen). This involves storytelling, case studies of master technicians, and reflective practices that help students internalize safety as a mark of a true professional, not just a rule to be followed. This directly applies Billett's concept of identity formation, aiming to cultivate safety as a virtue.

6. Conclusion and Discussion

The German Dual System's safety efficacy lies in its holistic ecosystem where law, economics, and pedagogy align to make safety an inseparable part of being a skilled worker. Its "Safety Genes"

function through a synergistic relationship between mandated structures, corporate rationality, and a pedagogy of situated identity formation. For China, the journey is not about importing a system, but about selectively integrating and adapting these "Safety Genes" into its own robust HVE body.

This requires a fundamental shift from a transactional view of safety education (teaching and testing rules) to a transformational one (cultivating virtues and identities within a community of practice). The proposed hybrid model—combining German-style standardisation and community-based learning with Chinese scalability and digital innovation—offers a promising pathway. Future research should focus on implementing and evaluating pilot programs based on this framework, measuring their impact on not just safety knowledge, but on safety behavior and the development of a lasting professional safety identity among graduates. The ultimate goal is to foster a generation of Chinese skilled workers for whom safety is not merely a procedure, but a core tenet of their professional being.

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