



Research on the Cultivation Path of Students' Labor Literacy from the Perspective of Labor Education Combined with Self-Organization Theory

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Abstract. From the perspective of self-organization theory, this paper explores the integration path of labor education and students' labor literacy cultivation. By analyzing the self-organizing system attributes of labor education—openness, nonlinearity, and dynamic balance—and addressing current problems such as cognitive deviations, fragmented curriculum systems, and insufficient home-school-community collaboration, this study proposes optimized paths for curriculum design, collaborative mechanisms, and evaluation systems, aiming to provide theoretical support for constructing an integrated labor education ecosystem.

Keywords: labor education; self-organization theory; labor literacy; cultivation path

1 Introduction

The principle that "education must be integrated with productive labor" constitutes the core tenet of Marxist educational philosophy on holistic human development, and serves as a fundamental requirement of China's educational policy. Labor education plays a vital role in cultivating students' practical skills, innovative thinking, and teamwork spirit. However, current labor education practices in China face multiple challenges, including oversimplified interpretations, lack of systematic curriculum design, and inefficient collaboration among families, schools, and communities.^[1] Self-organization theory, which emphasizes systemic openness, nonlinearity, and dynamic equilibrium, offers a novel perspective for addressing these issues.^[5] Integrating this theory into labor education can help establish a collaborative educational ecosystem and enhance students' labor literacy.^[4]

2 Theoretical Foundation and Practical Significance

Integrating education with productive labor is the core tenet of Marxist educational philosophy and a fundamental requirement of China's educational policy. Labor edu-

cation plays an irreplaceable role in fostering students' practical abilities, innovative thinking, and team spirit. However, current labor education practices are confronted with a structural dilemma: excessive external intervention and insufficient endogenous motivation have hindered its sustainable development.^[2]

Self-organization theory provides a new perspective to resolve this dilemma. This theory holds that systems spontaneously form ordered structures and achieve functional leaps through nonlinear interactions among internal elements, supported by continuous exchanges of materials, energy, and information with the external environment. The "Public Welfare Bicycle" project at Taiyuan University of Technology is a typical case in point. Based on their individual interests and expertise, students spontaneously formed functional modules responsible for maintenance, scheduling, and promotion, adjusting their roles through high-frequency internal feedback. A student's proposal to introduce QR code-based repair reporting, after repeated group discussions and iterations, was integrated into the service workflow, which significantly improved operational efficiency. This decentralized organizational form exhibits strong environmental adaptability and innovative fault tolerance, confirming that labor education inherently has the conditions to nurture self-organizing structures.

3 Current Dilemmas of Contemporary Labor Education

Contemporary labor education, a core part of cultivating well-rounded individuals, faces three intertwined dilemmas at the cognitive, curriculum and collaborative levels. These challenges impede its effective implementation, deviate from its educational purpose, and call for targeted and prompt solutions.

At the cognitive level, labor is oversimplified and utilitarian, distorting perceptions of both students and educators. Labor is narrowly defined as basic physical work such as cleaning and planting, while creative and service labor is overlooked, leaving students viewing labor as low-value drudgery. Worse, labor education is reduced to a mere credit-earning tool, treated as a peripheral course under exam-oriented education. Neither group grasps labor's core values of diligence and responsibility, fueling a vicious circle of prioritizing form over genuine educational meaning.

At the curriculum level, fragmented content and disjointed skill progression mar cross-stage teaching. There is no systematic, tiered planning across primary, junior and senior high schools, leading to repeated content, knowledge gaps and uncoordinated progress. Clear phased objectives and skill benchmarks are missing, with merely 27% of schools running coherent labor education programs spanning three years or more. Most rely on random short-term activities, leaving students unable to build a complete labor skill system and making education merely formalistic.

At the collaborative level, unclear role divisions and fragmented resources break family-school-community synergy. Schools lack sufficient venues and resources, families neglect labor guidance amid academic focus, and communities fail to serve as effective practice platforms. Resource isolation causes family participation to decline steadily as students advance grades, while social support systems remain disconnected and ineffective. These interwoven dilemmas form a development bottle-

neck; only targeted reforms can break the deadlock and restore labor education's inherent educational value.^[3]

4 Self-Organizing System Attributes of Labor Education

4.1 Openness

Openness is a key attribute of self-organizing systems, which enables their evolution through continuous interaction with the external environment, breaking the closed-loop limitations of traditional education and injecting sustained vitality into labor education practice. Unlike single, campus-based labor activities, open labor education takes the whole society as a practical carrier, actively absorbing diversified external resources and feedback to optimize its own operation. In the aforementioned public welfare bicycle project, the university introduced professional knowledge resources from community environmental organizations, absorbing practical experience in urban public facility management, and students adjusted recycling and maintenance strategies in real time based on daily feedback from community residents on bicycle usage and placement. This practice deeply embedded the educational functions of labor education into the urban governance system, breaking the separation between campus education and social practice, thus forming a two-way empowerment mechanism between educational entities and the social environment. It not only enhances students' practical labor capabilities and social responsibility, but also provides grass-roots intelligence support for community public welfare undertakings, realizing the mutual promotion and common development of education and society.

4.2 Nonlinearity

Nonlinearity means that minor changes in system variables can trigger qualitative changes in the entire system, subverting the linear thinking of "input equals output" in traditional labor education and highlighting the emergent and innovative value of practical labor. This attribute reflects that labor education is not a mechanical superposition of skills and tasks, but a dynamic process where small innovative attempts can drive comprehensive upgrading of the whole practice. For example, a student's casual proposal to improve the rust-proof coating of public bicycles triggered a chain reaction throughout the project: the optimized coating technology enhanced painting efficiency and prolonged bicycle service life, shortened the overall maintenance cycle, which in turn prompted the team to reconstruct the bicycle rescheduling algorithms to match the improved maintenance efficiency. Ultimately, the project's response speed to user feedback increased by 42%, and the service coverage and operation efficiency of public welfare bicycles were significantly improved. This fully demonstrates the emergent characteristics of nonlinear interactions in practical labor education scenarios, proving that small innovations in labor practice can drive systematic upgrading and release unexpected educational and practical benefits.

4.3 Dynamic Balance

Self-organizing systems achieve adaptive stability through positive and negative feedback regulation, constantly adjusting internal structures to adapt to external changes, which is also the core logic for labor education to maintain efficient operation amid variable scenarios. During the initial stage of a "Green Campus Initiative" in an elementary school, uneven task distribution and fuzzy responsibility division led to student inertia in participation and low activity efficiency. In response, students spontaneously formed rotating management teams, created visualized responsibility maps to clarify division of labor, and negotiated unified reward and punishment conventions. Through these independent adjustments, the collaborative order of labor activities gradually transformed from external constraint to intrinsic generation, and the initiative of participation was significantly improved. When campus drainage problems emerged during the rainy season, the system quickly carried out adaptive adjustments, launching a home-school collaborative emergency revision process: parents contributed their professional engineering knowledge to provide technical guidance, teachers guided students to conduct on-site observations and data analysis, and students took the lead in formulating and implementing drainage improvement plans. Through continuous iterative adjustments and feedback optimization, the distribution of rights and responsibilities among all parties became increasingly harmonious, and the labor education system maintained stable and efficient operation while coping with external changes, embodying strong adaptive capacity and resilience.

5 Cultivation Paths

5.1 Modular Curriculum Design

Based on the four dimensions of life labor, production labor, service labor, and innovation labor, a "Four-Domain Integration" curriculum framework is constructed. Combined with disciplinary advantages, technology-integrated modular courses are developed. For instance, the Computer Science program offers "Smart Energy System Practice," where students use real urban grid load data to develop dynamic dispatch models through time-series prediction and optimization algorithms, completing the entire process from simulation modeling to policy validation. Similarly, the Artificial Intelligence track provides "Transportation Data Analysis and Optimization," guiding students to collect multidimensional data such as bus passenger flow and road conditions to build intelligent dispatch models.

These courses adopt project-driven learning and formative assessment methods, integrating engineering thinking, systems analysis, and collaborative governance into specific task scenarios. This transforms labor education from simple skill training into a practical platform for developing students' professional competencies. Meanwhile, a digital management platform is developed to integrate task assignment, behavioral tracking, and performance evaluation. Blockchain technology is used to record students' participation trajectories to ensure data integrity, while machine learning performs clustering analysis on labor behavior patterns to dynamically adjust task diffi-

culty and collaboration structures. In addition, virtual simulation modules are included to simulate community governance conflict scenarios, training students' negotiation and decision-making skills under resource constraints and reshaping the organizational form of labor education.

5.2 Multi-Stakeholder Collaborative Mechanisms

Contractual agreements for resource integration are established among families, schools, and communities to clarify their respective roles and responsibilities. In Haiyang City's "Labor Practice Field" initiative, parents participate in planting planning based on their agricultural experience; teachers design interdisciplinary tasks to guide students in recording soil pH levels and crop growth cycles; and the community provides land and organizes seasonal markets to showcase students' practice results.

In Taiyuan University of Technology's "Public Bicycle" project, student teams conduct grid-based surveys on commuting habits, optimize parking routes using ergonomics principles, and provide smart lock training for users. After heavy rain caused vehicle rust, students collaborated with property management to renovate drainage channels and introduce a QR code repair reporting system, forming a closed-loop process of "problem detection—technical response—service iteration." Furthermore, Family Labor Day activities extend beyond the private domain, integrating community environmental governance through activities such as waste sorting supervision and stairwell lighting maintenance, which helps students foster a sense of responsibility through public labor participation.

At the enterprise level, a vertically integrated collaborative mechanism is established. An education group in Qingdao has developed a progressive labor education system: tool cognition workshops for primary school students, project-based maintenance courses for junior high school students, and vocational experience modules for senior high school students. Computer science students undertake ERP system maintenance tasks for local manufacturers; when corporate mentors identified data redundancy issues, student teams independently developed lightweight report generation plugins, which improved monthly statistical efficiency by 40% after three months of trial operation. A school-enterprise joint committee dynamically adjusts task gradients and resource support intensity according to students' ability development curves, thus forming a flexible labor education ecosystem.

5.3 Multi-Subject Collaborative Evaluation

A five-party evaluation framework involving families, schools, enterprises, communities, and students themselves is constructed to transform vague evaluation into structured and objective assessment.

Families observe students' labor habits and sense of responsibility in non-campus environments, providing evidence through monthly "Family Labor Observation Records" and descriptions of key events. Schools (teachers) evaluate students' skill mastery, standardized tool usage and management, team contributions in project tasks, and the quality of practice reports, based on course transcripts, process assessment

records, peer review reports, and work archives. Enterprises (mentors) assess the quality and efficiency of students' completion of real project tasks, their strategies and outcomes in addressing emergencies, their improvement suggestions or innovative contributions, and their professional competence and work discipline in real or simulated work scenarios, relying on corporate internship assessment forms, project outcome reports, and supervisor comments.

Communities provide feedback on the duration and frequency of students' public service participation, their proactive attitude in service delivery, their adherence to public order and morality, and their respect for service recipients, based on community service certifications, community worker evaluation forms, and documentary materials such as activity videos and thank-you letters. Students conduct self-assessments through regular reflection, which helps them deepen their understanding of labor value, identify their strengths and weaknesses, and clarify directions for future improvement. This self-evaluation is based on periodic self-assessment reports, growth portfolios (self-organized process evidence), and personal labor logs.

A "Labor Points Bank" quantitative model is adopted, with the following weight distribution: school (teachers) 25%, enterprise (mentors) 25%, community 20%, family 15%, and student self-assessment 15%. The weighted entropy method is used to integrate multi-source data, generating individual labor literacy radar charts and growth curves for each student. After implementing this evaluation system in an experimental school, researchers found a negative correlation between fluctuations in students' sense of responsibility and academic pressure cycles. This finding enables precise adjustments to the rhythm of labor task distribution, achieving targeted educational interventions and marking a paradigm shift from static outcome assessment to dynamic educational diagnosis.

6 Conclusion

Self-organization theory provides innovative perspectives and methodologies for labor education. Integrating this theory with labor education can effectively address current challenges in cultivating students' labor literacy. By establishing a theoretical framework that combines labor education with self-organization theory, we propose cultivation pathways in curriculum design, collaborative mechanisms, and evaluation systems. These approaches enhance students' labor participation, teamwork skills, and comprehensive competencies, while promoting integrated labor education across all educational levels and fostering coordinated development among families, schools, and communities. Future research should further explore the application mechanisms of self-organization theory in labor education, continuously improving the labor education system to better contribute to nurturing well-rounded socialist builders and successors.

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