



Technology-Enhanced Labor Education: A Survey on Integrating Practical Teaching into Higher Education in the Digital Age

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Abstract. With the acceleration of the digital transformation in education, labor education has gained increasing attention in higher education as a vital means to enhance students' practical skills, innovative thinking, and social adaptability. However, current labor education in universities faces challenges in curriculum design, technology integration, and evaluation mechanisms, such as excessive reliance on simple campus cleaning and voluntary labor, insufficient integration with digital tools like virtual simulation and AI-assisted practical training, and assessment only based on attendance rather than real labor capacity and practical performance. Based on a questionnaire survey of 220 college students, this study analyzes their cognitive levels, participation patterns, existing problems, and influencing factors regarding labor education. The findings reveal that while most students recognize the value of labor education, their engagement is constrained by factors like limited course forms, inadequate technical support, and imperfect evaluation systems. Grounded in data analysis, this research proposes pathways for deeply integrating labor education with practical teaching from the perspectives of educational technology innovation, curriculum system optimization, and intelligent evaluation mechanisms.

Keywords: Labor Education, Practical Teaching, Educational Technology, Holistic Development.

1 Introduction

Labor education serves as a critical component of higher education, aimed at cultivating students' practical abilities, social responsibility, and innovative thinking. The international educational community widely recognizes the value of hands-on activities in promoting knowledge internalization and holistic development, from Dewey's philosophy of learning by doing to the successful practice of Germany's dual system vocational education model. Against the backdrop of accelerating digital transformation and the rise of artificial intelligence (AI) technologies, higher education faces the shared challenge of effectively integrating technological resources to enhance teaching effectiveness and equip students with comprehensive competencies for future societies. Given its emphasis on practice, collaboration, and real-world problem-solving, labor education represents a significant area for exploring innovative applications of educational technology. However, the implementation of labor education in universities continues to encounter several challenges. On one hand, curriculum design often lags behind rapidly advancing educational technologies, resulting in monotonous formats that fail to stimulate deep student engagement. On the other hand, there is a lack of data-driven evaluation and feedback mechanisms for assessing learning processes and outcomes. These limitations hinder the potential of labor education to foster students' core competencies. Therefore, it is both theoretically and practically urgent to investigate how tools such as information technology, AI, and learning management systems can empower labor education. Developing a more interactive, personalized, and contemporarily relevant model is essential to keeping pace with evolving educational demands.

In this context, this study employs a questionnaire survey to analyze university students' awareness, participation, and influencing factors regarding labor education. It focuses on identifying feasible pathways for the deep integration of labor education and practical teaching enhanced by educational technology. The findings aim to provide data-driven support and strategic insights for optimizing labor education curriculum design and innovating technology-enhanced teaching models in the digital era, thereby addressing the global higher education agenda of cultivating innovative and interdisciplinary talents.

2 Literature Review

Research on labor education has a long history internationally, particularly in Europe and the United States, where it is closely integrated with vocational training and social practice, forming a relatively mature research system and implementation model. In the early 20th century, Dewey's concept of education as life and learning by doing established a fundamental paradigm for labor education. He pointed out that knowledge could not be separated from practical operation, and that real learning must occur through hands-on labor, social interaction, and problem-solving in authentic situations, rather than passive listening or rote memorization in classrooms [1]. This theory shifted labor from a peripheral activity to a core educational approach aimed at cultivating practical competence and critical thinking. For instance, Grobstein and Lesnick (2011)

further developed this view by emphasizing the importance of experiential and exploratory learning in labor practice, noting that formal education should retain the spontaneous, situational, and exploratory characteristics of informal learning [2]. Against this theoretical backdrop, labor education in the United States gradually evolved into a key component of practical education, widely incorporated into curricula at various educational levels.

Furthermore, countries such as Germany and France have conducted in-depth research and practice in vocational and labor education. Germany's dual system tightly integrates classroom teaching with on-the-job enterprise training, which effectively connects education with industrial demands and enables students to develop professional competence in real working environments. France emphasizes cultural inheritance through traditional arts, crafts and hands-on activities to strengthen students' cultural identity and aesthetic awareness. Overall, international research on labor education focuses on the integration of practice and social responsibility, highlighting the role of real-world labor experiences in enhancing students' personal qualities, social adaptability, and sense of responsibility.

Compared with these mature international models, labor education in China remains primarily policy-driven. Correspondingly, research on labor education by Chinese scholars started relatively late. However, driven by national policy initiatives in recent years, labor education has gradually become an important component of the educational system and a focus of academic research. First, research in China has deepened along with policy guidance. Since the release of the *Opinions on Strengthening Labor Education in Schools Across All Levels in the New Era* by the Central Committee of the Communist Party of China and the State Council in 2019, labor education has gained increasing attention as a crucial means of cultivating students' comprehensive qualities and practical abilities. Scholars have conducted extensive studies from both theoretical and practical perspectives. For example, Xiao and Li (2024) explored the integration of agricultural culture into labor education in agricultural universities, providing theoretical and practical support for nurturing a new generation with both agrarian awareness and practical skills [3]. Tian (2024) proposed optimization strategies for labor education in rural primary schools to improve its implementation and development [4]. Cai et al. (2024) developed a labor education curriculum framework based on engineering training centers, combining theory and practice to foster a culture of labor and creative praxis [5]. Second, some scholars have approached labor education from the perspective of curriculum design, exploring its integration with other subjects. Diao (2024) advocated for incorporating labor education into composition teaching by leveraging resources from moral, intellectual, physical, aesthetic, and labor education [6]. Qiu et al. (2024) constructed a tripartite collaborative (school-enterprise-community) model for a diversified labor education curriculum system to enhance the effectiveness of labor practices in vocational colleges, exploring models suited to the new era, social characteristics, and student needs [7]. Third, Chinese research particularly emphasizes the moral education function of labor education. Han (2024) proposed pathways for synergizing labor education and ideological-political education in vocational colleges, offering references for practical implementation [8]. Zhang (2024) highlighted labor education as a vital approach to promoting students' holistic development and fulfilling the

educational mission of fostering virtue [9]. Liu and Li (2024) examined the relationship between the Four Educations (moral, intellectual, physical, and aesthetic) and moral education, proposing innovations in teaching, faculty development, and characteristic vocational moral education to enhance the effectiveness of virtue cultivation [10].

3 Research Design and Data Analysis

3.1 Questionnaire Design and Collection

To further understand university students' awareness and comprehension of labor education, and to enhance the reliability and validity of the survey and analysis report, a preliminary questionnaire comprising 38 questions was designed. The questionnaire systematically investigated various aspects, including students' basic information, their understanding of the current state of labor, the meaning, core concepts, and significance of labor, the implementation approaches of labor education in universities, respondents' participation in labor education, their evaluation of current labor education programs in universities, and suggestions for improvement.

The questionnaire was developed through a rigorous process to ensure its validity. Firstly, an initial item pool was generated based on an extensive review of the existing literature on labor education and educational technology integration. Key dimensions identified for investigation included students' cognitive understanding of labor education, participation patterns, evaluation of current programs, and perceived influencing factors. Secondly, to ensure content validity, the preliminary questionnaire was reviewed by a panel of three experts specializing in educational technology and curriculum design. Their feedback was used to refine the wording of items, eliminate ambiguities, and ensure the questions comprehensively covered the core aspects of the research topic. Finally, a pilot test was conducted with a small group of 30 students not included in the final sample. The feedback from the pilot study regarding the clarity and comprehensibility of the items was incorporated to finalize the questionnaire.

3.2 University Students' Perceptions of Labor Education

This study aimed to conduct an exploratory investigation into the current landscape of labor education in Chinese universities. Accordingly, the analytical approach employed in this research is predominantly descriptive, focusing on providing a comprehensive overview of students' perceptions, participation patterns, and prevailing challenges. The findings offer valuable baseline data and identify critical areas that warrant further investigation using more advanced analytical methods. This descriptive approach facilitates a holistic understanding of the phenomenon from the students' perspective, serving as a crucial first step in informing the development of targeted interventions.

The ratio of respondents from rural (44.07%) and urban (55.93%) areas was approximately 1:1, and the gender ratio was about 1:1.25 (male to female), indicating a relatively balanced and representative sample. The survey revealed that 64.41% of university students considered labor education very important and an indispensable part of their development, 28.81% regarded it as relatively important in contemporary society

for fostering holistic growth, and 6.78% viewed it as moderately important, equivalent to other forms of education. In terms of its impact on personal development, most students believed that labor education enhanced self-management skills, fostered teamwork, strengthened a sense of responsibility, improved problem-solving abilities, and promoted mental well-being (Fig. 1).

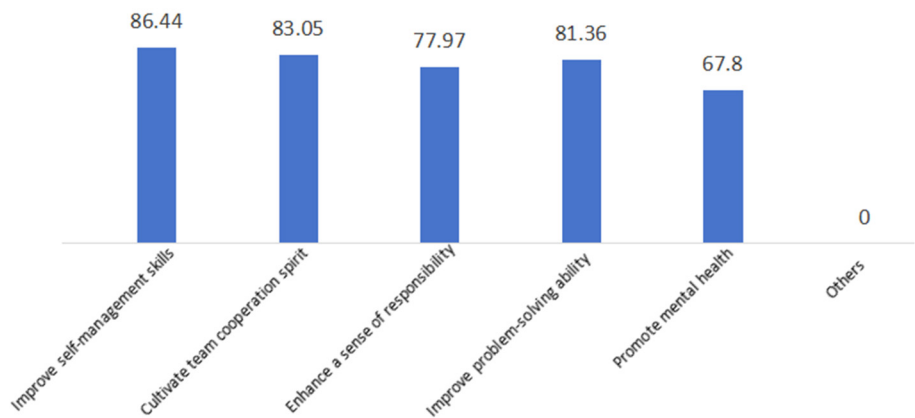


Fig. 1. Impact of Labor on Personal Development.

Regarding university students' participation in labor education, 72% believed that engaging in labor was necessary, 71% perceived no conflict between labor and academic studies, viewing them as complementary, and 69% supported incorporating labor education into graduation requirements. In terms of their understanding of labor, 62% of students associated labor with daily life activities. Additionally, 72% identified family-based labor education and household activities as the primary means of receiving labor education, 61% cited school classroom instruction and theoretical learning, and 74% mentioned on-campus volunteer activities and practical labor experiences (see Fig. 2).

The survey data indicated that all participating universities offered labor education activities, with approximately 82% providing structured labor education courses and programs. These courses primarily included self-directed learning via MOOC platforms, theoretical learning combined with practical activities, and instructor-led lectures on labor education theory. Furthermore, about 86% of universities had established specific evaluation frameworks for labor education, integrating it into their credit systems and linking it to graduation requirements, comprehensive evaluations, and scholarship assessments. The evaluation criteria for labor education courses focused on participation frequency and duration, practical outcomes, student feedback and engagement, teamwork performance, innovation, and labor efficiency.

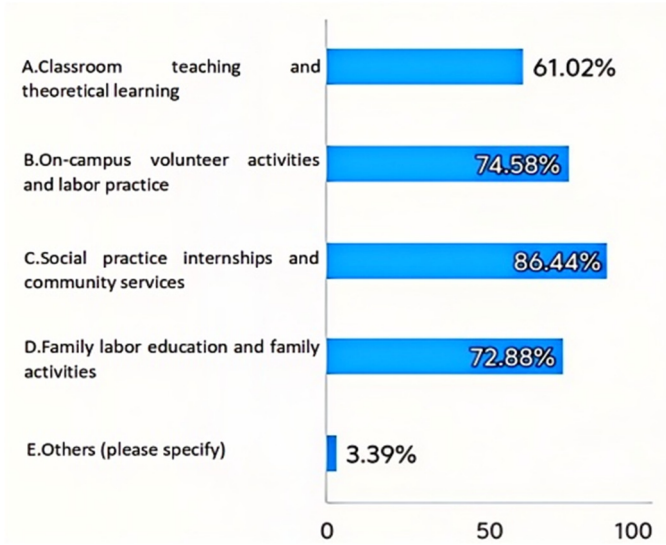


Fig. 2. University Students' Understanding of Labor Education.

According to the survey, university students spent an average of 1-5 hours per week on labor education-related courses. While 62% considered their university's labor education curriculum reasonably designed, students reported challenges such as monotonous activity formats, difficulties in time management, lack of professional guidance, and unclear evaluation standards or incentive mechanisms for labor outcomes. Universities also faced issues such as insufficient course offerings, limited activity diversity, inadequate promotion, and imperfect assessment methods. Based on the survey findings, the following key issues were identified:

1. Widespread recognition but low participation. While most students recognized the value of labor education, their actual participation was limited, with weak proactive engagement. This was particularly evident among "post-00s" students, whose reduced involvement in household labor was influenced by individualistic tendencies, societal advancements, reduced manual labor due to automation, and comfortable family environments, leading to a lack of voluntary labor habits.

2. Gap between theory and practice. Although students acquired theoretical knowledge about labor from textbooks, their practical engagement was insufficient, with some even avoiding physical labor. This disconnect between theory and practice, or lack of hands-on experience, rendered labor activities superficial.

3. Incomplete labor education systems. University labor education programs lacked comprehensive frameworks and clear practical guidelines. Insufficient emphasis on curriculum-based training and skill development resulted in students' inadequate mastery of labor-related knowledge and skills.

4. Limited diversity in labor activities. Current labor practices predominantly focused on campus maintenance tasks, lacking alignment with broader societal labor needs. This narrow scope undermined the potential of labor education to cultivate students' practical value and developmental significance.

5. Deficient evaluation mechanisms. The assessment of labor education was inadequate, relying solely on proof of participation for credit allocation. This approach failed to effectively evaluate the outcomes of labor education, hindering objective and comprehensive assessment.

4 Analysis of Issues in University Labor Education

4.1 Imperfect Labor Education System

Although universities have responded to national policies by establishing labor education courses and organizing related activities, the survey indicates that the current labor education system remains imperfect. According to the data, nearly 36% of students report that labor education courses, while available, are fragmented in form, and about 17% state that their universities offer only sporadic activities without fixed courses (see Fig. 3).

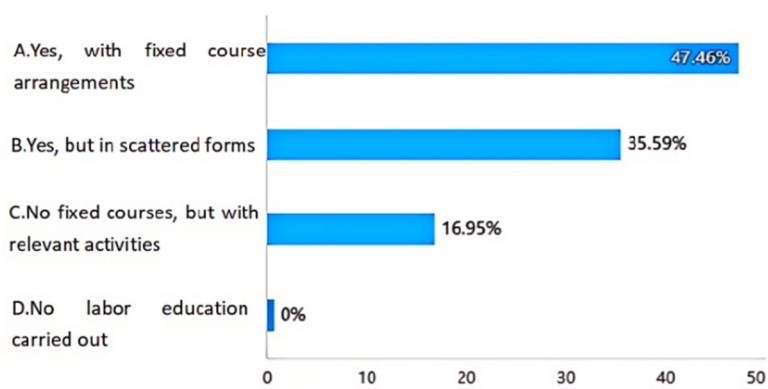


Fig. 3. Current Status of Fixed Labor Education Courses or Activities in Universities.

In terms of curriculum design and resource allocation, universities tend to prioritize knowledge-based education, focusing primarily on theoretical instruction or video-based teaching platforms, while undervaluing the role and significance of labor education. Nearly 90% of labor education is delivered through MOOC platforms for self-directed learning. Although the digital era has brought innovations in educational formats, students' engagement with these platforms often remains superficial, lacking genuine effort to understand or internalize the essence of labor values. Labor education generally occupies a supplementary role in the curriculum. For instance, practical training and social practice courses account for a relatively small proportion of students' overall programs compared to specialized courses, resulting in weaker influence and impact. Additionally, 1.69% of students report being unaware of their universities' labor education course offerings. While this percentage is small, it highlights gaps in the implementation of labor education, including insufficient communication of teaching and learning objectives (see Fig. 4).

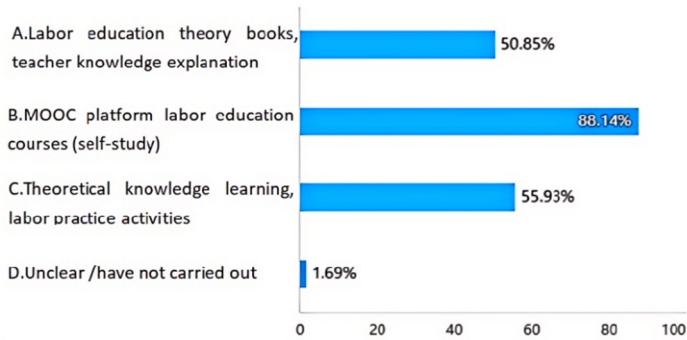


Fig. 4. Survey Results on the Content of Labor Education Courses in Universities.

4.2 Insufficient Integration of Labor Education with Modern Technology

Survey data indicate that current university labor education still faces significant limitations in both form and content. Among respondents, 86.44% participate in labor activities primarily organized by their universities, such as volunteer services, while 71.19% engage in part-time jobs or internships (see Fig. 5). However, these activities are largely confined to traditional forms (e.g., campus cleaning, basic work-study programs) and lack integration with modern vocational skills and cutting-edge technologies (e.g., artificial intelligence, big data analytics), failing to meet the demands of the digital era for interdisciplinary talent.

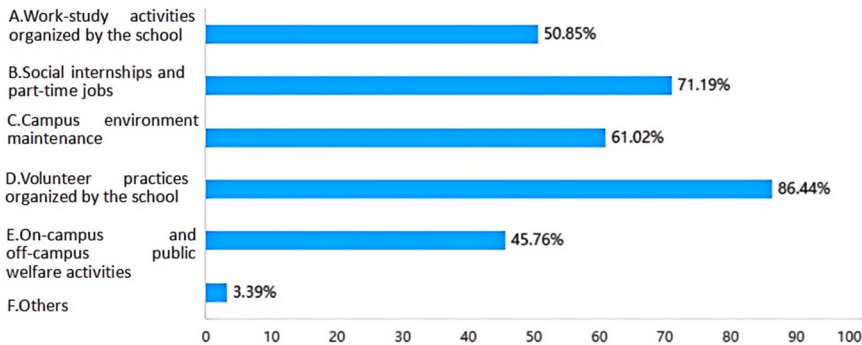


Fig. 5. Survey Results on Students' Participation in Labor Education Activities.

The singular nature of these practices hinders the effective alignment of labor education with students' academic backgrounds and diminishes its practical value. For example, computer science students rarely have opportunities to participate in software development-related labor practices, while engineering students seldom engage with modern labor scenarios such as intelligent equipment maintenance. Questionnaire analysis shows that 93.22% of students narrowly define labor as a means to meet basic life needs, overlooking its creative and innovative dimensions.

5 Factors Influencing Labor Education Competencies and Perceptions

5.1 Deficiency in Family Labor Education

The survey reveals that university students exhibit low participation rates in household chores during family life. Most students grew up in families that prioritized academic education over practical labor skills, with some even unfamiliar with basic cleaning tools (e.g., brooms, mops) during their university years. This educational approach has resulted in a lack of labor awareness and habits among students. Data indicate that 3.39% of students participate in labor solely for monetary rewards, while another 3.39% do so only when compelled. Furthermore, parents often undervalue labor activities, perceiving them merely as physical tasks with limited worth, thereby overlooking their crucial role in cultivating students' practical and innovative capabilities (see Fig. 6).

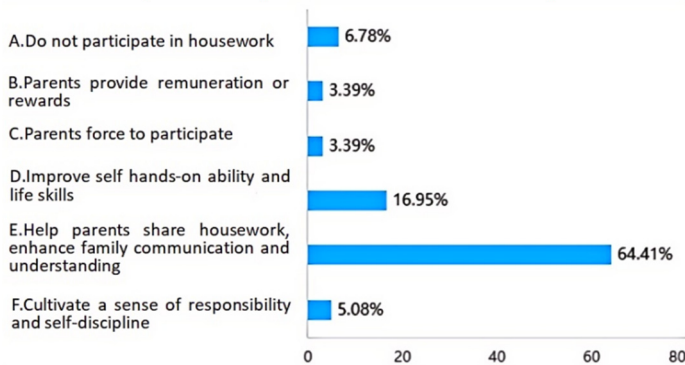


Fig. 6. Purposes of Participating in Labor Practices in Family Life.

5.2 Impact of Negative Social Trends

Current societal attitudes toward labor education present a polarized landscape, characterized by either passive labor attitudes or extreme hierarchical views of labor. On one hand, the lying flat culture (a mindset rejecting excessive competition) has gradually eroded students' vitality and motivation. This culture advocates abandoning conventional paths to success (e.g., career advancement, material possessions), influencing young people's perceptions of labor. Some believe that hard work yields inadequate returns, leading to disengagement and negative labor attitudes. Such skepticism undermines the value of labor and fosters resistance to labor education, ultimately diminishing its effectiveness in developing students' labor competencies and skills.

On the other hand, hyper-competitive environments distort students' understanding of labor value, stratifying labor into rigid hierarchies and overemphasizing superficial markers like money, grades, and status. The pervasive involution (excessive competition without real progress) across industries subjects students to immense pressure, potentially fostering resentment toward labor as an additional burden. This competitive mindset may also lead students to disregard the intrinsic value of labor, viewing it as

inferior or unimportant—an attitude detrimental to labor education's goals of nurturing labor literacy.

Questionnaire analysis shows that 93.22% of students narrowly define labor as a means to meet basic life needs, overlooking its creative and innovative dimensions. Many prioritize academics and employment prospects, neglecting labor's role in personal growth. Additionally, 47.46% view labor participation as a tool to earn credits or awards, resulting in superficial engagement (see Fig. 7).

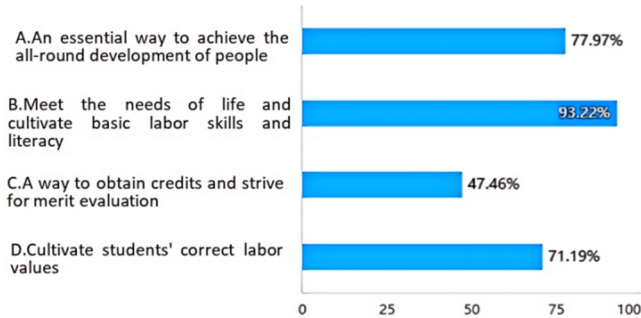


Fig. 7. Perceptions of the Significance of Labor Education.

5.3 Insufficient Motivation in University Labor Education

Survey data indicate that 59.32% of students criticize the limited and monotonous curriculum, while 55.93% highlight flawed assessment systems. Notably, 41% attribute these issues to inadequate promotion, reflecting gaps in implementation—some students remain unaware of labor education initiatives due to poor communication channels. Furthermore, many universities lack specialized faculty for labor education, compromising teaching quality and outcomes. Insufficient resources (e.g., facilities, equipment, venues) also hinder effective delivery (see Fig. 8).

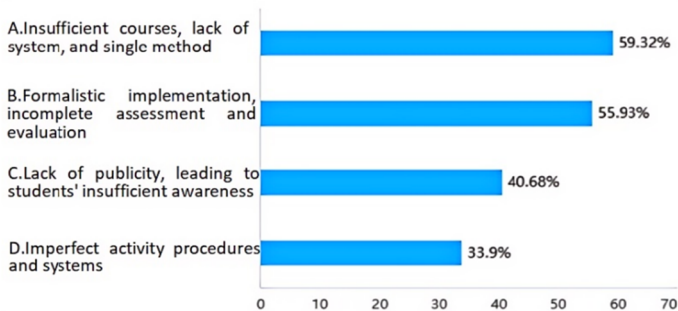


Fig. 8. Current Shortcomings in University Labor Education.

Universities' evaluation methods for labor education lack scientific rigor and systematicity, overemphasizing theoretical knowledge while neglecting practical skills and labor outcomes. Data show that 82% of assessments focus on participation frequency

and duration, with only 35.59% evaluating innovation and efficiency. This narrow focus on superficial performance ignores students' effort and progress during labor processes, limiting opportunities to gain practical experience and develop innovative capabilities. Such misaligned incentives reduce student motivation and fail to authentically reflect labor literacy or skill levels (see Fig. 9).

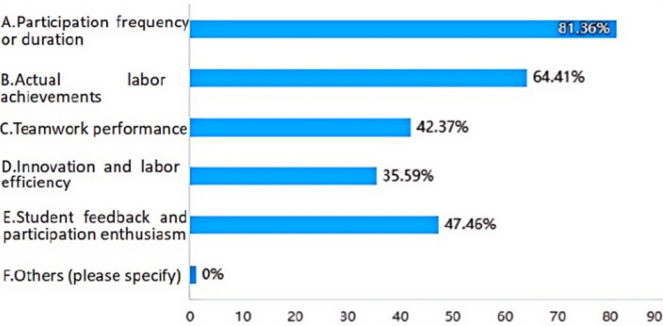


Fig. 9. Evaluation Criteria for University Labor Education Courses/Activities.

6 Suggestions

6.1 Constructing a Technology-Enhanced Hybrid Labor Education Model

Universities should move beyond traditional practical formats to develop a hybrid labor education model that integrates online and offline activities. Specifically, digital tools such as virtual simulation, project-based learning (PBL), and online collaboration platforms can be introduced to create labor tasks closely linked to real-world contexts. For example, virtual reality (VR) technology can simulate complex engineering scenarios or social service environments, allowing students to engage in risk-free exploration and trial-and-error learning. Beyond general simulations, specific implementations could include using VR to recreate the operational environment of an intelligent manufacturing line for mechanical engineering students. This would allow them to practice equipment calibration, fault diagnosis, and safety procedures without the risks and costs associated with physical machinery. For urban planning students, VR could simulate community development scenarios, enabling them to engage in virtual labor related to spatial design and resource allocation. Such a technology-enhanced model not only diversifies the forms of labor education but also effectively cultivates students' digital collaboration skills.

6.2 Utilizing Learning Analytics and Artificial Intelligence to Personalize Practical Pathways

To bridge the gap between labor education and academic disciplines, we propose leveraging learning analytics and artificial intelligence to create differentiated practical pathways. This approach utilizes data continuously collected from learning management systems (e.g., video completion rates, quiz scores), practical activity records (e.g.,

project milestones, peer feedback), and student profiles (e.g., majors, career interests) to inform a structured, data-driven recommendation system. A collaborative filtering algorithm analyzes this integrated data to identify students with similar learning behaviors and successful outcomes, enabling personalized project suggestions, such as recommending open-source software contributions to a computer science student excelling in data structures. These tailored recommendations are delivered through a centralized dashboard on the labor education platform, where student feedback on relevance creates an iterative feedback loop, continuously refining the algorithm's accuracy and ensuring alignment with individual academic backgrounds and skill levels. This personalized design is expected to effectively improve student initiative and participation in labor practice, enhance the alignment between labor tasks and students' majors, and make labor education more targeted and systematic.

6.3 Establishing a Data-Based Comprehensive Evaluation and Management System for Labor Education

To establish a sustainable framework for labor education, we propose developing an integrated information management platform that operationalizes intelligent evaluation through a multi-dimensional, data-informed approach. This system would comprehensively track student engagement metrics, including platform logins, time-on-task, and submission punctuality, while employing predefined rubrics and Natural Language Processing techniques to assess the quality of submitted artifacts such as design documents and code repositories. Collaboration metrics derived from communication tools like Slack would quantify teamwork dynamics, whereas outcome evaluation would combine automated testing (e.g., unit tests for coding projects) with expert and peer reviews to gauge practicality and innovation. All data would be synthesized into a dynamic dashboard visualizing student progress through competency radar charts, emphasizing formative feedback over summative grades. For instance, a pilot in a Digital Fabrication course could track lab usage, design iterations, and prototype functionality, generating holistic reports that reduce instructor burden while providing students with transparent developmental insights. This integrated mechanism not only supports objective instructor assessment but also fosters a virtuous cycle of practice-evaluation-feedback-optimization, ensuring labor education's effectiveness aligns with both process and outcome excellence. The expected outcomes include more comprehensive and objective evaluation, reduced human bias, clearer feedback for students, and improved overall quality of labor education. The system can be further piloted and verified in specific courses.

6.4 Fostering an Online-Offline Integrated Innovative Labor Culture

Moving beyond mere ideological advocacy, universities should actively utilize digital media and social networks to cultivate a campus labor culture that celebrates innovation and practice. For instance, online labor education communities can be created to showcase students' creative project outcomes; virtual maker marathons or innovative labor

competitions can be organized. Industry leaders can be invited to share insights on future work skills. By integrating the core values of perseverance and innovation inherent in the model worker spirit into these dynamic, technology-enabled activities, students can be more effectively guided to recognize the new connotations of labor in the knowledge economy era, thereby intrinsically motivating them to engage in labor and value creation.

7 Conclusion

This study systematically investigates the current state, challenges, and technology-enhanced pathways of labor education in Chinese higher education institutions through a questionnaire survey of 220 university students. The findings reveal that while the majority of students recognize the value of labor education for holistic development, their actual participation remains low and often superficial. Key problems include an imperfect curriculum system, insufficient integration with modern digital technologies, monotonous activity forms, a disconnect between theory and practice, and a lack of scientific evaluation mechanisms. Furthermore, deficiencies in family labor education and the influence of negative social trends further weaken students' motivation and correct understanding of labor.

In response to these challenges, this study proposes a technology-empowered framework for reforming labor education. First, a hybrid online-offline labor education model supported by virtual simulation and project-based learning can enrich forms and contexts of practice. Second, learning analytics and artificial intelligence can be used to design personalized practical pathways that align with students' academic backgrounds and career interests, thereby enhancing engagement and relevance. Third, a data-driven comprehensive evaluation and management system, integrating multi-dimensional metrics and intelligent feedback, can replace current attendance-only assessments and support continuous improvement. Finally, fostering an online-offline integrated innovative labor culture through digital communities and competitions can reshape students' perceptions of labor in the knowledge economy era.

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Disclosure of Interests

The authors have no competing interests to declare that are relevant to the content of this article.

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