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From Cognitive Advantage to Competitive Disadvantage: A Multidimensional Analysis of How Digital Literacy "Knowing Without Doing" Undermines Vocational College Students' Employability in Western China

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Abstract

Against the backdrop of the rapidly developing digital economy, digital literacy has become a critical factor influencing individuals' employability. Existing research often treats digital literacy as a homogeneous whole, lacking in-depth exploration of its multidimensional structure and its differential impacts. This study, focusing on vocational college students in Western China, employed a quantitative cross-sectional survey design based on 743 valid questionnaires, using descriptive statistics, multiple linear regression, and Importance-Performance Analysis (IPA) to systematically examine the mechanism through which the four dimensions of digital literacy affect employability. The findings are as follows: (1) Students' digital literacy exhibits a structural imbalance characterized by "high cognition, low practice, and weak responsibility." (2) Regression analysis revealed that digital application and digital responsibility had the strongest positive predictive effects on employability. (3) IPA further indicated that digital application and digital responsibility fall into the "high importance—low performance" quadrant, representing critical shortcomings. The study demonstrates that the uneven development within digital literacy, particularly the "knowing without doing," may undermine employment competitiveness. Vocational education should shift from merely "enhancing literacy levels" to "optimizing literacy structure."

Keywords: *Digital Literacy, Employability, Vocational college students, Importance-performance analysis (IPA)*

1. Introduction

Amidst the rapidly developing digital and networked economy and society, technological innovation and iteration are driving social change at an unprecedented pace, reshaping the landscape of various industries (Lu, 2023). The deep penetration of advanced technologies such as artificial intelligence and big data has not only given rise to new professions like data analysts and AI engineers (Acemoglu & Restrepo, 2017) but has also placed new demands on the core competencies of all workers. In this wave of transformation, digital literacy has evolved from an additional skill into a crucial indicator measuring an individual's comprehensive quality and determining their career adaptability and development potential (Al-Hattami, 2025). The United States explicitly listed digital

literacy as a fundamental skill for learners in the face of social informatization and economic globalization in its *Framework for 21st Century Skills* released in 2007. Similarly, the European Union emphasized digital literacy as a primary skill for 21st-century workers and consumers in its *Digital Skills Declaration* issued in 2015. In 2021, China's Cyberspace Administration formulated the *Action Outline for Enhancing the Digital Literacy and Skills of the Whole People*, proposing to strengthen the development of digital technology-related disciplines in higher education institutions, improve the mechanism for cultivating digital innovation talents, enhance the quality and level of talent development, and encourage students to engage in innovation and entrepreneurship using digital technologies. Thus, enhancing citizens' digital literacy has become a widespread consensus in the international community.

Existing research has indicated that digital literacy can significantly improve an individual's efficiency in perceiving, utilizing, and transforming career information, thereby securing more high-quality opportunities in intense employment competition (Pirzada & Khan, 2013). Strong digital literacy not only helps enhance university students' capabilities for self-directed learning, logical thinking, and analytical judgment (Umardiyah & Amaliah, 2021) but also strengthens their employability, aiding their better adaptation to digital work environments, improving problem-solving and innovation capabilities (Wang & Jiao, 2023), and reinforcing their ethical awareness and social responsibility (Milenkova & Lendzhova, 2021). Furthermore, job seekers with higher digital skills are more likely to obtain high-quality employment (Asiati et al., 2018), and employees with strong digital literacy are often better integrated into digital work scenarios, improving work efficiency and professional competitiveness, thereby promoting career development and enhancing job satisfaction and stability (Victoria & Juliana, 2012; Lyu & Luo, 2024).

Currently, with the continuous expansion of the graduate population in China, vocational college students face not only competitive pressure from job seekers with higher academic qualifications (Tan, 2023) but also the need to align with the new qualities increasingly valued by employers during digital transformation, such as solid digital literacy, efficient information processing abilities, and innovative thinking (Bejaković & Mrnjavac, 2020). Therefore, for higher vocational education, which aims to serve regional industries and cultivate high-quality technical and skilled talents, systematically fostering students' digital literacy is undoubtedly an essential pathway to enhance their employment competitiveness and respond to the demands of industrial digital transformation. Western China holds a pivotal position in the country’s overall reform, development, and stability, serving as a vital strategic support for advancing Chinese-style modernization. Moreover, the digitalization process of vocational education in this region lags significantly behind that of the eastern developed areas (Jiang & Yang, 2023; Pu & Cao, 2025). It is precisely this gap, along with the region’s importance to the national strategy of coordinated regional development, that makes Western China a critical research field for examining the effectiveness of digital literacy cultivation and diagnosing structural shortcomings. This gap not only limits students’ career development potential but also affects the overall quality of vocational education in Western China.

With the development of theory and practice, the connotation of digital literacy has been widely understood as a multidimensional and comprehensive competency system. Its conceptual meaning has gradually expanded from an early emphasis on the operation and

understanding of digital information (Gilster, 1997) to encompass multiple dimensions such as cognition, skills, behavior, and ethics. Definitions of digital literacy by institutions like the European Union and UNESCO explicitly include dimensions such as information processing, communication and collaboration, content creation, safety, and problem-solving. Chinese scholars and relevant policy documents also emphasize that digital literacy is a composite of knowledge, skills, attitudes, and values (Zhang, 2006; Li, 2012). This demonstrates that digital literacy is not a homogeneous whole but a composite structure consisting of interrelated yet potentially independently developing internal dimensions.

However, when exploring the relationship between digital literacy and employability, existing research has predominantly treated digital literacy as a unitary concept for measurement and correlational analysis (Mohammadyari & Singh, 2015; Marsh, 2021; Sadık Tatlı et al., 2023; Pilav-Velić et al., 2021). While this approach verifies a positive correlation at a macro level, it obscures the potential differential contributions of its internal dimensions and the complex effects that may arise from uneven development among them. Therefore, this study aims to move beyond the limitation of treating digital literacy as a homogeneous entity by conducting a detailed analysis of its internal multidimensional structure. It seeks to explore the contribution of different dimensions of digital literacy to the employability of vocational college students. This will provide solid empirical evidence and reform directions for vocational colleges to shift from an extensive focus on "enhancing literacy levels" to a more precise strategy of "optimizing the literacy structure."

2. Research Objectives

2.1 To systematically measure the performance levels of vocational college students in Western China across various dimensions of digital literacy using descriptive statistical analysis (including means and standard deviations).

2.2 To examine the predictive effects of different dimensions of digital literacy on the employability of vocational college students and the magnitude of these effects by constructing a multiple linear regression model.

2.3 To diagnose the strengths and weaknesses in the process of cultivating digital literacy among vocational college students by constructing an Importance-Performance Analysis (IPA) framework, using standardized regression coefficients as importance indicators and self-rated dimension scores as performance indicators.

3. Research Questions

3.1 What are the score levels of vocational college students across the various dimensions of digital literacy?

3.2 Do all dimensions of digital literacy positively influence the employability of vocational college students?

3.3 Based on IPA, what adjustments should vocational colleges make to their cultivation strategies for students' digital literacy?

4. Literature Review

4.1 Digital Literacy

The conceptual definition of digital literacy has continuously evolved alongside the development of digital technology, undergoing a significant shift from a single-skills orientation to a multidimensional and comprehensive literacy. Early definitions focused primarily on technical operation itself. For instance, Gilster (1997) defined it as the ability to access, understand, and utilize digital information. Subsequently, scholars have progressively expanded its scope. Eshet (2004) proposed that digital literacy should encompass not only the skills to use software and hardware but also the cognitive and socio-emotional abilities required for working, learning, and communicating in digital environments. Martin (2008) further elevated it to a form of social practice, advocating for its cultivation across three dimensions: digital competence, digital usage, and digital transformation, thereby highlighting its integrative role in personal development and social participation.

The framework development by international organizations has further solidified its multidimensional structure. The European Union (2006) defined it as "the ability to critically use information tools" within its key competencies framework and gradually refined it between 2015 and 2017 into a system encompassing five dimensions: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Building on this foundation, UNESCO formulated the *Global Framework for Digital Literacy*, emphasizing the use of digital technologies in a safe and appropriate manner to promote employment and decent work, reflecting the integration of the literacy concept with safety and responsibility.

In the Chinese context, the concept of digital literacy similarly exhibits a trend toward multidimensionality and comprehensiveness. Zhang (2006) summarized it as the new knowledge and skills required in the digital age, while Li (2012) placed greater emphasis on the integration of critical cognition, responsible dissemination, and effective interaction. *The 2021 Action Outline for Enhancing the Digital Literacy and Skills of the Whole People* further defined it officially as a composite set of qualities and abilities covering digital acquisition, creation, use, evaluation, interaction, sharing, innovation, safety, and ethics, embodying a stance of multidimensional and systematic construction.

Thus, the conceptual evolution of digital literacy has progressed from an initial focus on technical operation and information processing to gradually incorporating multiple aspects such as cognition, socio-emotional skills, ethical responsibility, and practical application, ultimately forming a comprehensive framework encompassing knowledge, skills, attitudes, and values. This paradigm shift from "skills" to "literacy" indicates that digital literacy should be regarded as a multidimensional construct. Consequently, this study adopts the four-dimensional framework for digital literacy proposed by Cai (2024), defining it as: a comprehensive competency system through which individuals, in a digitalized society, achieve career development fit, solve practical problems, and drive innovation by organically integrating digital awareness, digital application competence, digital responsibility awareness, and digital knowledge and skills.

4.2 Employability

The concept of employability originated in early 20th-century Britain (Beveridge, 1912) and has undergone further iterations and refinements in the 21st century. It has evolved from an initial simple binary concept of being employable or unemployable into a multifaceted construct encompassing the micro-level of individual career choice and development, the meso-level of organizational development, and the macro-level of labor market optimization (Feng et al., 2024).

From a practical perspective, Robinson (2000) posited that employability skills are the core abilities individuals need to acquire, maintain, and perform in a job. These skills encompass not only specific operational techniques but also necessary attitudes and behavioral patterns, collectively enabling employees to build harmonious relationships with colleagues and superiors and to make sound, critical decisions at work. Harvey (2001) defined employability as the composite capability to engage in further learning and master the multiple skills required for employment. McQuaid and Lindsay (2005) defined employability as an individual's ability to gain and maintain employment within the labor market. They argued that this ability depends not only on personal factors such as an individual's skills, knowledge, and attitudes but also on a combination of personal circumstances (e.g., family responsibilities, health) and external factors (e.g., labor market conditions, policy environment). Subsequently, McQuaid et al. (2005) further conceptualized employability from both narrow and broad perspectives. In the narrow sense, employability focuses on whether an individual possesses the abilities required to perform a specific job; broadly, it encompasses the various factors influencing an individual's actual acquisition or transition of work opportunities in the labor market. From a more macro perspective, Guilbert et al. (2016) viewed employability as the probability for an individual to obtain suitable work and maintain employment. This probability stems from the dynamic and evolving interplay between government and educational policies, organizational strategies, personal characteristics, and the social, economic, cultural, and technological environment. Within the framework of the Employability Capital Growth Model (ECGM), Donald et al. (2024) conceptualized employability as a cumulative process of multiple forms of capital. The accumulation of these capitals collectively enhances an individual's self-perception of their employability and improves their adaptability in the labor market.

In China, research perspectives on the concept of employability are similarly diverse and multifaceted. Ruan and Luo (2024) defined employability as the comprehensive ability an individual possesses in the process of non-agricultural employment to secure job opportunities, adapt to changes in the employment environment, meet employment requirements, and sustainably maintain employment status. Focusing on university students, Jiang et al. (2024) viewed employability as the core competency cluster acquired by students through systematic learning and cultivation during their studies, constituting an organic combination of knowledge, skills, and attitudes that makes an individual attractive to employers. Cai et al. (2024) provided a more detailed classification of employability, dividing it into two types: internal and external employability. Internal employability refers to an individual's ability to remain employed within their current organization, reflecting their level of competitiveness and irreplaceability in their current position. External employability, on the other hand, refers to an individual's ability to seek and obtain desired work, reflecting their potential to change jobs and be re-employed in

other organizations. Li and Tan (2021), among others, focused their research on female migrant workers, defining their employability as the sum of work-related technologies, knowledge, and abilities necessary to meet the basic living needs of individuals and their families.

In summary, employability refers to an individual's ability in the labor market, through their own knowledge, skills, attitudes, and values, to successfully obtain job opportunities, perform well continuously at work, and achieve personal career development. It serves as a crucial indicator for measuring an individual's competitiveness and adaptability in the professional domain.

Focusing on the vocational college student population, this study defines employability as follows: within an employment environment characterized by both digitalization and regionalization, it is a dynamic competency system through which vocational college students, by integrating and applying multidimensional abilities such as professional knowledge, practical skills, analytical-problem, communication and collaboration, environmental adaptation, occupational literacy, and innovative thinking, achieve smooth employment, job competence, and long-term career development.

4.3 Vocational Education and Digital Literacy

In the era of the digital economy, digital literacy has become a core competency for individuals to adapt to societal development (Yang, 2026). The Chinese government places high importance on digital literacy education, providing institutional guarantees for the digital transformation of vocational education through top-level policy design. The newly revised *Vocational Education Law of the People's Republic of China in 2022* explicitly positions vocational education as "a type of education that interconnects with general education and embodies the concept of lifelong learning," setting the core goal of "cultivating high-quality technical and skilled talents." *The Key Tasks for Enhancing the Digital Literacy and Skills of the Whole People in 2024*, jointly issued by the Ministry of Education and three other departments, further emphasizes the need to improve the vocational education and training system for digital skills. This involves measures such as dynamically adjusting the professional catalog, promoting the digital transformation of curricula, and implementing the "1+X certificate system" to build a high-level digital skills talent cultivation system.

As the main front for cultivating technical and skilled talents, the essence of vocational education lies in its focus on fostering professional competence (Fan & Yan, 2026). Digital literacy, being a key competency for talents in the digital economy era, refers to the comprehensive ability of individuals to effectively perform complex tasks in digital environments, including information acquisition, comprehension and analysis, innovative application, and value assessment. It specifically encompasses dimensions such as computer operation skills, information filtering and integration capabilities, digital content creation, online collaboration and communication, as well as digital ethics and security awareness. These competency elements are deeply aligned with the practical demands of job positions.

Against the backdrop of accelerating industrial digital transformation and the development of new quality productive forces, vocational education needs to systematically strengthen the cultivation of digital literacy based on the demands of

vocational scenarios. By deeply integrating digital technology into the professional teaching system, a talent cultivation model driven by both "professional competence and digital literacy" should be constructed. This enables students to master not only the professional skills required for their positions but also the ability to efficiently solve problems, innovate in practice, and adapt to technological changes within digital work environments (Li, 2026; Yang & Chen, 2025). This "dual-wheel drive" model not only addresses the structural contradiction between talent supply and demand but also provides crucial support for the development of new quality productive forces, demonstrating the mission of vocational education in serving national strategies.

4.4 Digital Literacy and Employability

Numerous studies have confirmed that digital literacy exerts a significant positive influence on an individual's employability. Digital literacy education enables students to master advanced digital tools and deeply integrate professional knowledge with digital technology, thereby solving complex professional problems and enhancing practical application capabilities (Yang & Chen, 2024). For instance, integrating Computer-Aided Design(CAD) and digital teaching software into majors such as mechanical engineering and early childhood education can directly strengthen students' professional competitiveness. Digital literacy encompasses not only technical operation but also inherently includes aspects such as digital responsibility, security awareness, ethical judgment, and a spirit of collaboration. Cultivating these qualities helps students adhere to norms, protect data security, and engage in effective collaboration within digital workplaces, thereby gaining employer trust (Tao & Ma, 2025; Liu et al., 2025). Furthermore, digital literacy allows students to efficiently utilize online platforms for job information filtering, resume submission, and self-presentation, broadening their employment opportunities. Simultaneously, it endows students with the capacity for continuous learning and adaptation to technological change, which is crucial for responding to the dynamic demands of positions in the digital era (Zhao, 2025; Liu et al., 2025).

Thus, digital literacy contributes to the enhancement of employability through multiple levels and pathways. It not only strengthens students' professional skills and job competency characterized by technological integration but also shapes critical professional qualities aligned with digital workplace requirements, such as a sense of responsibility, ethical judgment, and a collaborative spirit. Additionally, it expands their capacity for sustainable development by leveraging digital means to access opportunities and adapt to future changes. These findings collectively indicate that digital literacy has become a core pillar of individual employability within the context of the digital economy, and its cultivation has emerged as a strategic link connecting educational supply with labor market demands.

4.5 Research Gap and Theoretical Framework

Although existing studies have generally confirmed the positive influence of digital literacy on employability, a critical methodological gap remains: the vast majority of research treats digital literacy as a homogeneous, unidimensional construct for measurement and correlation analysis (Mohammadyari & Singh, 2015; Marsh, 2021; Sadık Tatlı et al., 2023; Pilav-Velić et al., 2021). While this approach verifies the basic proposition at a macro level—"the higher the level of digital literacy, the stronger the employability"—it fails to answer questions of greater theoretical and practical value: Do different

dimensions of digital literacy have differentiated contributions to employability? How does uneven development among dimensions (e.g., "high cognition, low practice") affect ultimate employment competitiveness? In other words, existing research has not distinguished between two fundamentally different intervention pathways: "enhancing overall level" versus "optimizing internal structure."

This study is designed precisely to address this gap. Rather than treating digital literacy as a unitary variable, we deconstruct it into four interrelated but potentially independently developing dimensions and examine their respective weights of influence on employability. This research orientation helps reveal the following: if cultivation resources are overly concentrated on dimensions that "perform well but contribute little" (e.g., digital awareness), while neglecting dimensions that "perform poorly but contribute greatly" (e.g., digital application and digital responsibility), a mismatch may occur in which "literacy levels improve but employment competitiveness does not grow correspondingly."

Based on the above analysis, this study adopts the four-dimensional framework of digital literacy proposed by Cai (2024) as its theoretical foundation. The reasons for selecting this framework are as follows: First, the framework integrates common elements from mainstream frameworks both domestically and internationally (e.g., the EU DigComp, UNESCO framework, and China's *Action Outline*), demonstrating cross-cultural applicability. Second, it clearly distinguishes four relatively independent dimensions—cognition (digital awareness), skills (digital knowledge & technology), behavior (digital application), and ethics (digital responsibility)—which aligns well with the need of this study to "deconstruct internal structure." Third, the framework has been preliminarily validated among the Chinese vocational college student population (Cai, 2024), exhibiting good reliability and content validity. Therefore, this study employs the four dimensions of this framework as core independent variables to examine their respective predictive effects on employability.

5. Research Methodology

5.1 Research Design

To achieve the aforementioned research objectives, this study followed a logical pathway of "status description—relationship testing—strategy diagnosis" and designed corresponding research methods and data analysis plans. The specifics are as follows:

Firstly, to systematically characterize the basic features of vocational college students' digital literacy (Objective 1), a digital literacy assessment scale was employed for measurement. Descriptive statistical methods were used to analyze the mean and standard deviation of the sample regarding overall digital literacy and its individual dimensions, thereby presenting their levels and internal structure.

Secondly, to examine the differential impact of different dimensions of digital literacy on employability (Objective 2), a multiple linear regression model was constructed. The four dimensions of digital literacy served as independent variables, with employability as the dependent variable. Regression analysis was conducted using SPSS 26.0, focusing on the standardized regression coefficients and their significance for each dimension, in order to identify key influencing factors.

Finally, to translate the empirical findings into a basis for educational improvement (Objective 3), the study employed the Importance-Performance Analysis (IPA) tool proposed by Martilla and James (1977). An IPA quadrant map was constructed, using the standardized regression coefficient of each dimension on employability as the vertical axis (Importance) and the self-rated mean score of each dimension as the horizontal axis (Performance). The arithmetic mean of the importance scores of the four dimensions and the arithmetic mean of the performance scores served as the benchmark lines dividing the four quadrants. This map visually reveals the optimization zone of each digital literacy dimension, thereby providing a strategic reference for vocational colleges to implement targeted and structured cultivation of digital literacy.

5.2 Research Population and Sample

The study population of this research consists of vocational college students in western China. Western China primarily includes twelve provincial-level administrative regions: Shaanxi Province, Sichuan Province, Yunnan Province, Guizhou Province, Guangxi Zhuang Autonomous Region, Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, Tibet Autonomous Region, Xinjiang Uygur Autonomous Region, Inner Mongolia Autonomous Region, and Chongqing Municipality. According to the 2023 Education Statistics released by the Ministry of Education of China, there are currently 454 vocational colleges in western China, with approximately 4.91 million students enrolled.

According to Song Wenguang (2021), the study employed a non-repeated sampling method, with the sample size calculation formula presented as follows:

$$n = \frac{Nt^2p(1-p)}{N\Delta_p^2 + t^2p(1-p)}$$

N represents the total population size, with N = 4,905,565 in this study;

t is the t-value corresponding to the probability level of sampling error. In this study, a 99% confidence level adopted, the corresponding t-value is 2.58;

Δp is the maximum sampling error, which is set at 0.05 in this study;

P is the sampling proportion. To ensure a larger sample size and keep the error within the predetermined range, P is set at 0.5 in this study.

By substituting these values into the formula, the necessary sample size for this study is calculated to be 666 participants.

$$\frac{4905565 * 2.58^2 * 0.5(1-0.5)}{4905565 * 0.05^2 + 2.58^2 * 0.5(1-0.5)} \approx 666$$

5.3 Sampling Procedure

This study employed a quantitative, cross-sectional survey design. Self-report data on vocational college students' digital literacy dimensions and employability in Western China were collected through a one-time questionnaire survey to describe the current situation and explore relationships among variables. Considering that differences may exist across regions and types of vocational colleges, a two-stage stratified simple random

sampling method was adopted to sample vocational college students in Western China during the data collection phase.

Stage One: To ensure representativeness of the sample, one public and one private institution from each region were selected. All vocational colleges in the 12 regions of Western China were first stratified by region and by institutional type (public, private), forming 24 sampling frames. Within each sampling frame, institutions were sorted alphabetically by name, and a random number table was used to generate one random number per frame, thereby determining the sampled institutions. (Note: Due to the absence of private vocational colleges in the Tibet region, both institutions sampled from this region were public vocational colleges.)

Stage Two: Within each sampled institution, students were selected using a simple random sampling method proportional to the actual student enrollment. Based on the minimum required effective sample size (666 participants) calculated previously, the number of students to be drawn from each institution was determined proportionally to ensure that the total sample size met the requirement. To complete data collection, this study used a combination of online and offline methods. Through the online channel, a professional questionnaire platform (Wenjuan.com) was used, and instructors or academic advisors at target institutions were commissioned to randomly distribute the questionnaire link to students. Through the offline channel, the researcher personally visited campuses and randomly selected students to complete paper questionnaires on site. A total of 900 questionnaires were distributed. After excluding invalid questionnaires due to excessively short completion time (less than 120 seconds), incomplete responses, or obvious response tendencies (e.g., selecting the same option for all items), 743 valid questionnaires were finally obtained, yielding an effective response rate of 82.56%.

5.4 Ethical Considerations

This study strictly adhered to academic research ethical norms. The research protocol was formally approved by the Rangsit University Ethics Review Board (Ethics Approval Number: RSUERB2025-203). Prior to data collection, all potential participants were clearly informed of the research purpose, the principle of voluntary participation, data confidentiality measures, and the right to withdraw from the study at any time. All participants confirmed their informed consent either by clicking the “Agree” button online or by signing a paper informed consent form offline. Questionnaire data were collected anonymously, with no personally identifiable information (such as name, student ID, or contact information) recorded, and were used solely for academic research purposes. All data were stored on encrypted devices and kept strictly confidential by the research team.

5.5 Research Instruments

This study adopted the Digital Literacy Assessment Scale developed by Cai Yuhui (2024) as the data collection instrument. This scale consists of four dimensions: digital awareness, digital application, digital responsibility, and digital knowledge and skills.

Given the multidimensional and comprehensive nature of the employability construct, the development of the employability scale in this study integrated findings from multiple scholars. Specifically, the dimensions of professional knowledge and practical skills drew upon the work of Zhang Huiling (2020); the analytical-problem and

communication-collaboration dimensions cited the results of Wang Yuan (2006); the dimensions of environmental adaptation and occupational literacy were informed by the research of Shen Ting and Ye Yinghua (2024); and the innovative thinking dimension was based on the findings of Han Chengxi (2014). By synthesizing these research outcomes, this study ultimately formed an employability scale comprising seven dimensions.

5.6 Reliability and Validity Testing

5.6.1 Reliability Testing

After conducting reliability analysis on the Digital Literacy scale, the Employability scale using SPSS 26 software, the results showed that the Cronbach's α coefficient for each secondary dimension under all four scales exceeded 0.7. Therefore, the scales used in this study demonstrated high overall internal consistency.

Table 1. Reliability Test Results

Scales	Dimension	Cronbach's α	N of Items
Digital Literacy	Digital Awareness(DLAW)	0.873	5
	Digital Application(DLAP)	0.847	5
	Digital Responsibility(DLRE)	0.843	5
	Digital Knowledge and Skills(DLKS)	0.823	4
Employability	Professional Knowledge(DLPK)	0.743	3
	Practical Skills(DLPS)	0.856	3
	Analytical-Problem(DLAP)	0.865	4
	Communication-Collaboration(DLCC)	0.818	3
	Environmental Adaptation(DLEA)	0.869	4
	Occupational Literacy(DLOL)	0.798	3
	Innovative Thinking(DLIT)	0.854	4

5.6.2 Validity Testing

5.6.2.1 Confirmatory Factor Analysis of the Digital Literacy Scale

(1) Model Fit

Confirmatory factor analysis (CFA) was conducted on the Digital Literacy Scale used in this study using AMOS 26 software. The results showed: $\chi^2/df = 1.179$, RMSEA = 0.016, SRMR = 0.022. All three fit indices were below the reference thresholds, indicating that the CFA model constructed in this study had small error and good model fit. Furthermore, GFI = 0.976, AGFI = 0.969, NFI = 0.970, TLI = 0.995, and CFI = 0.995, all exceeding the reference value of 0.8. The model fit indices of this CFA demonstrated good performance, indicating a high degree of congruence between the model and the data.

Table 2. Model Fit

Indicator	X^2/DF	RMSEA	SRMR	GFI	AGFI	NFI	TLI	CFI
Reference value	≤3	＜0.08	＜0.08	≥0.8	≥0.8	≥0.8	≥0.8	≥0.8
Measured value	1.179	0.016	0.022	0.976	0.969	0.970	0.995	0.995

(2) Composite Reliability and Convergent Validity Analysis

By calculating composite reliability and convergent validity values, it can be observed that the average variance extracted (AVE) for the four latent variables under the Digital Literacy Scale all exceeded the reference value of 0.5, and the composite reliability (CR) values all exceeded the reference value of 0.7. Furthermore, the standardized path coefficients (Std) for each observed variable were all above 0.6. Therefore, the Digital Literacy Scale used in this study demonstrates high stability and reliability.

Table 3. Composite Reliability and Convergent Validity

Path	Estimate	S.E.	C.R.	P	AVE	CR
DLAW5<DLAW	0.724					
DLAW4<DLAW	0.768	0.054	19.470	***		
DLAW3<DLAW	0.767	0.054	19.467	***	0.579	0.873
DLAW2<DLAW	0.756	0.055	19.188	***		
DLAW1<DLAW	0.788	0.054	19.949	***		
DLAP5<DLAP	0.734					
DLAP4<DLAP	0.716	0.053	17.920	***		
DLAP3<DLAP	0.736	0.055	18.367	***	0.526	0.847
DLAP2<DLAP	0.745	0.054	18.580	***		
DLAP1<DLAP	0.694	0.054	17.398	***		
DLRE5<DLRE	0.728					
DLRE4<DLRE	0.713	0.056	17.599	***		
DLRE3<DLRE	0.725	0.057	17.884	***	0.518	0.843
DLRE2<DLRE	0.679	0.055	16.822	***		
DLRE1<DLRE	0.750	0.056	18.421	***		
DLKS4<DLKS	0.760					
DLKS3<DLKS	0.722	0.053	17.924	***	0.537	0.823
DLKS2<DLKS	0.734	0.053	18.187	***		
DLKS1<DLKS	0.715	0.051	17.774	***		

Note: *** indicates a significance level of 0.001.

(3) Discriminant Validity Analysis

The results of discriminant validity analysis showed that there were indeed certain correlations among the four dimensions under the Digital Literacy Scale; however, the correlation coefficients between these variables did not exceed the square root of their respective average variance extracted (AVE) values. Therefore, the four variables under the Digital Literacy Scale are conceptually relatively independent, and the discriminant validity test was passed.

Table 4. Discriminant Validity

Dimension	DLKS	DLRE	DLAP	DLAW
DLKS	**0.733**			
DLRE	0.326	**0.720**		
DLAP	0.347	0.330	**0.725**	
DLAW	0.364	0.239	0.212	**0.761**

In summary, the confirmatory factor analysis results of the Digital Literacy Scale indicate that the model fit is good, the measurement instrument is valid, and this provides a solid foundation for subsequent research.

5.6.2.2 Confirmatory Factor Analysis of the Employability Scale

(1) Model Fit

Confirmatory factor analysis (CFA) was conducted on the Employability Scale used in this study using AMOS 26 software. The results showed: $\chi^2/df = 1.377$, RMSEA = 0.023, SRMR = 0.023. All three fit indices were below the reference thresholds, indicating that the CFA model constructed in this study had small error and good model fit. Furthermore, GFI = 0.966, AGFI = 0.956, NFI = 0.961, TLI = 0.987, and CFI = 0.989, all exceeding the reference value of 0.8. The model fit indices of this CFA demonstrated good performance, indicating a high degree of congruence between the model and the data.

Table 5. Composite Reliability and Convergent Validity

Indicator	X^2/DF	RMSEA	SRMR	GFI	AGFI	NFI	TLI	CFI
Reference value	≤3	＜0.08	＜0.08	≥0.8	≥0.8	≥0.8	≥0.8	≥0.8
Measured value	1.377	0.023	0.023	0.966	0.956	0.961	0.987	0.989

(2) Composite Reliability and Convergent Validity Analysis

By calculating composite reliability and convergent validity values, it can be observed that the average variance extracted (AVE) for the Employability Scale used in this study exceeded the reference value of 0.5, and the composite reliability (CR) values exceeded the reference value of 0.7. Furthermore, the standardized path coefficients (Std) for each observed variable were all above 0.6. Therefore, the Employability Scale used in this study demonstrates high stability and reliability.

Table 6. Composite Reliability and Convergent Validity

Path	Estimate	S.E.	C.R.	P	AVE	CR
EMPK3<EMPK	0.688					
EMPK2<EMPK	0.714	0.065	15.422	***	0.500	0.744
EMPK1<EMPK	0.702	0.071	15.263	***		
EMPS3<EMPS	0.808					
EMPS2<EMPS	0.814	0.046	22.424	***	0.665	0.856
EMPS1<EMPS	0.824	0.044	22.608	***		
EMAP1<EMAP	0.772					
EMAP2<EMAP	0.765	0.047	20.600	***	0.616	0.865
EMAP3<EMAP	0.791	0.049	21.320	***		
EMAP4<EMAP	0.811	0.048	21.845	***		
EMCC3<EMCC	0.808					
EMCC2<EMCC	0.778	0.049	19.430	***	0.601	0.819
EMCC1<EMCC	0.739	0.049	18.813	***		
EMEA1<EMEA	0.754				0.625	0.869

EMEA2<EMEA	0.802	0.048	21.434	***		
EMEA3<EMEA	0.804	0.049	21.473	***		
EMEA4<EMEA	0.800	0.048	21.370	***		
EMOL3<EMOL	0.783					
EMOL2<EMOL	0.765	0.054	18.349	***	0.570	0.799
EMOL1<EMOL	0.715	0.051	17.550	***		
EMIT1<EMIT	0.759					
EMIT2<EMIT	0.773	0.053	20.089	***	0.596	0.855
EMIT3<EMIT	0.762	0.052	19.816	***		
EMIT4<EMIT	0.793	0.052	20.550	***		

Note: *** indicates a significance level of 0.001.

(3) Discriminant Validity Analysis

The results of discriminant validity analysis showed that there were indeed certain correlations among the seven dimensions under the Employability Scale; however, the correlation coefficients between these variables did not exceed the square root of their respective average variance extracted (AVE) values. Therefore, the seven variables under the Employability Scale are conceptually relatively independent, and the discriminant validity test was passed.

Table 7. Discriminant Validity

Dimension	EMIT	EMOL	EMEA	EMCC	EMAP	EMPS	EMPK
EMIT	**0.772**						
EMOL	0.146	**0.755**					
EMEA	0.150	0.461	**0.791**				
EMCC	0.359	0.246	0.389	**0.775**			
EMAP	0.369	0.235	0.353	0.277	**0.785**		
EMPS	0.163	0.375	0.431	0.242	0.213	**0.815**	
EMPK	0.175	0.606	0.637	0.380	0.358	0.397	**0.707**

In summary, the confirmatory factor analysis results of the Employability Scale indicate that the model fit is good and the measurement instrument is valid.

5.7 Common Method Bias Testing

Since the independent variables (digital literacy) and dependent variable (employability) in this study were collected from the same participant group, at the same time point, and using the same questionnaire instrument, common method variance (CMV) may be a concern. To test the severity of such bias, this study employed Harman's single-factor test, conducting an unrotated exploratory factor analysis on all scale items. The results showed that the cumulative variance explained by the first unrotated factor was only 23%, well below the critical threshold of 50%. Accordingly, it can be concluded that common method bias does not pose a serious problem in this study (Podsakoff et al., 2003).

6. Results

A total of 743 valid samples were collected in this study. The distribution of sample demographic characteristics is as follows:

In terms of gender composition, there were 379 male participants (accounting for 51.01%) and 364 female participants (accounting for 48.99%), indicating a generally balanced gender ratio. Regarding grade distribution, second-year students constituted the largest proportion at 42.13% (313 students), followed by first-year students at 27.99% (208 students), and third-year students at 29.88% (222 students). The sample covered a wide range of academic majors. Engineering majors ranked first with a proportion of 29.88% (222 students), followed by Economics and Management majors (26.78%), and Healthcare-related majors (22.34%). Arts majors and other majors accounted for 11.84% and 11.44%, respectively.

In terms of family educational background, 42.13% of the participants had parents with associate or bachelor's degrees, 35.13% had parents with a high school education or below, and 22.75% came from families where parents held postgraduate degrees. Regarding digital tool usage habits, over half of the students (55.85%) reported frequent weekly use of digital tools for learning, 27.46% maintained a moderate frequency of 2-3 times per week, while only 16.69% of students reported rarely using digital tools.

6.1 Digital Literacy Level

The findings revealed that the overall digital literacy of vocational college students was at a moderate level (3.20 ± 0.74). Performance across dimensions showed structural differences:

The Digital Awareness dimension performed the best (3.67 ± 0.99), reaching a high level. This indicates that students had a relatively clear understanding of the social value and professional significance of digital literacy, along with a certain degree of willingness for digital learning and awareness of innovation.

However, the dimensions of Digital Application ability (3.11±1.14), Digital Knowledge and Skills (3.06±1.18), and Digital Responsibility (2.95±1.15) all fell within the moderate range and were below the overall mean. This reflects that students' awareness in areas such as digital ethics, information security, and behavioral norms was relatively weak, revealing a practical dilemma of "knowing but not doing."

In summary, vocational college students had initially formed a basic cognitive framework for digital literacy. However, at the level of practical application, they exhibited the dilemma of "knowing but not doing." Furthermore, in the practice of digital behaviors, some students had not established a complete ethical framework. Their ability to discern key issues such as data privacy protection and the boundaries of online behavior was weak, presenting a dual risk of ambiguous legal understanding and misconduct in practical actions.

Table 8. Self-Assessment Scores for Each Dimension of Digital Sheep

Variables	Mean	Std. Deviation	Level
Digital Literacy	3.20	0.74	Moderate
Digital Awareness	3.67	0.99	High
Digital Application	3.11	1.14	Moderate
Digital Responsibility	2.95	1.15	Moderate
Digital Knowledge and Skills	3.06	1.18	Moderate

6.2 Employability Level

Based on the self-assessment results of employability from 743 participants, the overall employability self-rated score was 3.24±0.71, which is at a moderate level. At the dimensional level, significant structural differentiation emerged: Professional Knowledge (3.53±1.07), Practical Skills (3.56±1.20), Environmental Adaptation (3.51±1.16), and Occupational Literacy (3.56±1.14) performed notably well, not only exceeding the overall mean but also reaching a high level. Analytical-Problem Solving Ability (3.08±1.24) and Communication-Collaboration Ability (3.08±1.21) fell within the moderate range. The self-rated score for the Innovation dimension was only 2.35±1.13, which was not only below the overall mean but also at a low level.

Thus, influenced by the practice-oriented training model of vocational education, through the cultivation mechanism integrating work-study and industry-education collaboration, vocational college students have developed significant advantages in practical operation and job adaptation. However, this practice-oriented cultivation system may inadvertently inhibit the development of their innovative thinking.

Table 9. Self-Assessment Scores for Each Dimension of Employability

Variable	Min	Max	Mean	Std. Deviation
Employability	**1.33**	**4.70**	**3.24**	**0.71**
Professional Knowledge	1.00	5.00	3.53	1.07
Practical Skills	1.00	5.00	3.56	1.20
Analytical-Problem	1.00	5.00	3.08	1.24
Communication-Collaboration	1.00	5.00	3.08	1.21
Environmental Adaptation	1.00	5.00	3.51	1.16
Occupational Literacy	1.00	5.00	3.56	1.14
Innovative Thinking	1.00	5.00	2.35	1.13

6.3 Analysis of the Impact of Digital Literacy on Employability

The regression analysis results show: the regression model had an R^2=0.445, and an adjusted R^2=0.442, meaning these four dimensions of digital literacy collectively explained 44.2% of the variation in vocational college students' employability. The F-value was 148.225 (p<0.001), indicating that the overall regression model was statistically significant and possessed strong explanatory power. The t-values corresponding to the regression coefficients for the four independent variables—digital awareness, digital application, digital responsibility, and digital knowledge & technology—all exceeded the critical value, with p <0.001, reaching a statistically significant level. This indicates that, when controlling for other variables, each dimension independently and significantly

positively predicted employability.

By further comparing the standardized regression coefficients (Std β), it can be seen that the influence of digital application was the strongest (β=0.340, t=11.537***), meaning improvements in students' digital application ability most significantly promoted their employability. This was followed by digital responsibility (β=0.257, t =8.744***) and digital awareness (β=0.231, t=7.927***), with digital knowledge & technology having the smallest coefficient (β=0.168, t=5.543***).

The Variance Inflation Factor (VIF) values for all independent variables were below the reference threshold of 5 (Cohen et al., 2003), indicating no severe multicollinearity issues among the independent variables, and thus the estimated regression coefficients are stable and reliable.

In summary, the regression analysis results clearly demonstrate that all four dimensions of digital literacy (digital awareness, digital application, digital responsibility, and digital knowledge & technology) had a significant positive impact on the employability of vocational college students. Among them, digital application ability contributed the most, highlighting the core role of practical operational skills in employment competitiveness. The importance of digital responsibility and digital awareness was also relatively prominent, while foundational digital knowledge & technology remained an indispensable positive factor.

Table 10. Regression Analysis Results

Variables	Un.Std B	Std β	t	VIF
(Constant)	1.186		13.045***	
Digital Awareness	0.167	0.231	7.927***	1.132
Digital Application	0.213	0.340	11.537***	1.154
Digital Responsibility	0.159	0.257	8.744***	1.149
Digital Knowledge and Skills	0.102	0.168	5.543***	1.216
R^2		0.445		
Adjusted R^2		0.442		
F		148.225***		

Note: *** indicates a significance level of 0.001.

6.4 IPA Analysis

To translate the statistical impact of various digital literacy dimensions on employability into a clear basis for educational improvement, this study employed Importance-Performance Analysis (IPA). This method, presented as a two-dimensional matrix, can intuitively reveal the alignment between each dimension's "importance to employability" and "students' current performance level," thereby identifying strengths, weaknesses, and resource allocation priorities in the cultivation process. Based on the IPA matrix:

The dimensions of Digital Application and Digital Responsibility fell within the Concentrate Here quadrant (High Importance—Low Performance). This indicates that they had the strongest predictive effect on employability (β=0.340 and 0.257, respectively), serving as key levers for enhancing employment competitiveness. However, students' self-

assessment scores in these two dimensions were relatively low (3.11 and 2.95, respectively). This contradiction highlights a core shortcoming in the current cultivation system of vocational colleges: the most critical competencies are precisely the areas where students are weakest.

The dimension of Digital Awareness was located in the Possible Overkill quadrant (Low Importance—High Performance). Students achieved the highest self-assessment score in this dimension (3.67), indicating that cultivation at the cognitive and attitudinal levels has yielded relatively good results. However, its relative contribution to employability (β=0.231) was below the average importance score, suggesting a potential "over-allocation" of educational resources—meaning the investment did not translate into a corresponding gain in employment competitiveness.

The dimension of Digital Knowledge & Technology fell into the Low Priority quadrant (Low Importance—Low Performance). This shows that its contribution to employability was relatively smaller (β=0.168), and student performance in this area was also at a moderate level (3.06). This implies that, within the current employability-oriented optimization framework, this dimension is not an immediate priority for reinforcement.

It is noteworthy that no dimension in this study fell within the Keep Up the Good Work quadrant (High Importance—High Performance). This indicates that currently, no single dimension has achieved simultaneous leadership in both "high impact" and "high-level development." This result further underscores the urgency for vocational colleges to reform their digital literacy education.

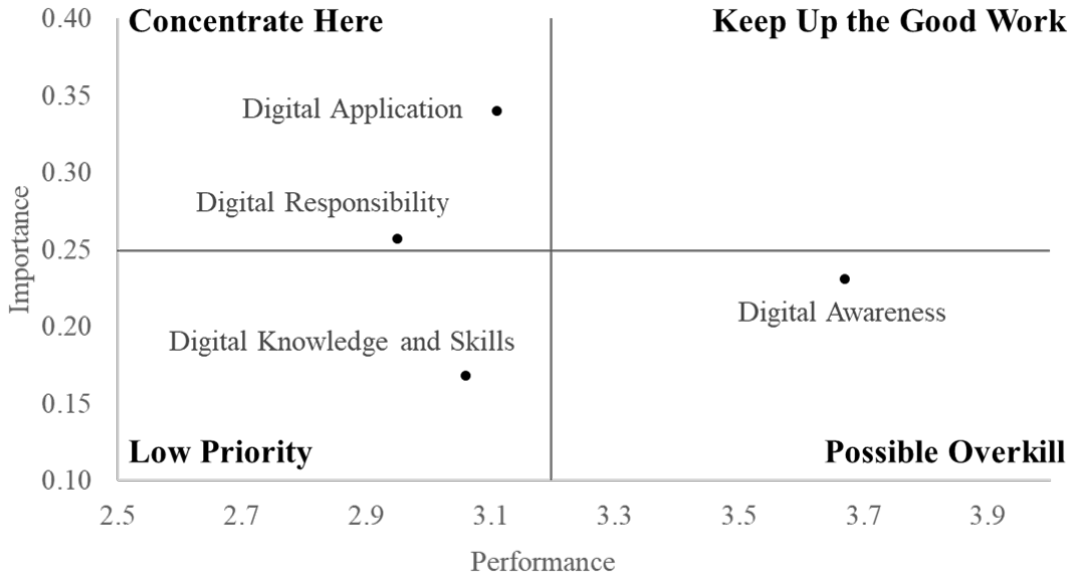

Figure 1 : IPA Quadrant Chart

7. Discussion

This study, based on a survey of 743 vocational college students in Western China, reveals the differential impact of the multidimensional structure of digital literacy on employability and identifies key shortcomings in the current cultivation system. The results

indicate that vocational college students' digital literacy exhibits a notable characteristic of "high cognition, low practice, and weak responsibility," with significant variations in the contribution of its different dimensions to employability.

7.1 "Knowing Without Doing": The Dilemma of Transforming Cognitive Advantage into Competitive Disadvantage

The study found that students scored highest in the dimension of digital awareness (M=3.67), reaching a "high level," while their performance in the dimensions of digital application (M=3.11) and digital responsibility (M=2.95) was merely "moderate," forming a typical imbalanced pattern of "cognition-practice-responsibility" development. This finding reveals that vocational college students may be caught in a transformation dilemma of "from cognitive advantage in digital literacy to competitive disadvantage in employability." That is, although students have established a relatively good foundation in digital cognition and attitude, it has not been effectively translated into observable application capabilities and responsible behavior (Tao & Ma, 2025). This phenomenon of "knowing without doing," against the backdrop of an intensely competitive job market (Tan, 2023), may dilute or even reverse the "advantage" built at the cognitive level in actual job seeking and work performance.

The results of the regression analysis further underscore the severity of this contradiction. The dimensions with the strongest predictive power for employability were precisely those where student performance was weakest: digital application (β=0.340) and digital responsibility (β=0.257). This indicates that the key competency elements determining employment competitiveness are exactly the students' areas of weakness.

This result explicitly engages with and complements earlier research paradigms that treated digital literacy as a homogeneous whole. For example, Mohammadyari & Singh (2015) conceptualized digital literacy as a single second-order construct and found it had a significant positive impact on individual performance, but did not differentiate the contribution of different dimensions. This study does not refute their overall conclusion that "digital literacy is beneficial"; rather, it extends their theoretical perspective by revealing that when digital literacy is deconstructed into a multidimensional structure, the predictive power of different dimensions varies significantly (β ranging from 0.168 to 0.340). In other words, merely enhancing the "overall level" of digital literacy may mask internal structural imbalances, and it is precisely this imbalance—particularly the low performance of high-impact dimensions—that may constitute the core mechanism undermining students' employability. Similarly, Pilav-Velić et al. (2021) explored the chain pathway through which digital literacy affects innovative work performance via practical behavior, yet they also operationalized digital literacy as a single variable. This study finds that the contribution of the digital application dimension (β=0.340) far exceeds that of the digital knowledge and skills dimension (β=0.168), thereby further refining the theoretical model of Pilav-Velić and colleagues: not all components of digital literacy drive practical behavior and work performance to the same extent; the transformative value of application ability is much higher than that of static knowledge. Therefore, this study does not simply negate previous findings but rather proposes a revised perspective on their basis: "optimizing structure is more important than enhancing level."

7.2 Alternative Explanations for Low Digital Application Performance

Before attributing the low scores in digital application and digital responsibility solely to pedagogical shortcomings, it is necessary to acknowledge several alternative explanations. First, the digital infrastructure in Western China is relatively underdeveloped (Jiang & Yang, 2023; Pu & Cao, 2025). Some vocational colleges may face issues such as outdated computer equipment, insufficient network bandwidth, and a lack of training software, which directly limit students' opportunities for high-frequency, high-quality digital application practice. Second, students' family socioeconomic backgrounds may also play a role. In the sample of this study, over 35% of participants had parents with an education level of high school or below. Lower family income and lower rates of digital device ownership may result in students lacking adequate digital practice experience before entering college, thereby lowering their self-efficacy and performance scores. Furthermore, the level of regional industrial digitalization lags behind that of the eastern regions, and students have fewer opportunities to access cutting-edge digital tools during internships or part-time work, which may also weaken their motivation and contextual support for transferring application abilities. Therefore, the low scores in digital application should be understood as the combined result of pedagogical, infrastructural, and socioeconomic factors. Future research should further disentangle the relative weights of these effects through multilevel modeling or qualitative interviews.

7.3 The Implications of the Digital Responsibility Dimension and Dialogue with the Literature

The importance of digital responsibility (β=0.257) is second only to digital application, yet it received the lowest score (M=2.95). This finding carries significant implications. It indicates that in the digital era, possessing skills without corresponding ethical norms, security awareness, and social responsibility (Milenkova & Lendzhova, 2021) may not only pose risks but also limit the completeness and sustainability of one's employability (Donald et al., 2024). Milenkova & Lendzhova (2021) emphasized that digital citizenship should encompass responsibility, rights, and critical thinking, but they did not establish a quantitative link with specific employability indicators. This study, for the first time, empirically tests the independent predictive effect of digital responsibility on employability within a sample of Chinese vocational college students, thereby advancing digital responsibility from the realm of theoretical advocacy to the level of actionable cultivation priorities. Meanwhile, the Employability Capital Growth Model (ECGM) proposed by Donald et al. (2024) covers multiple forms of capital such as human capital, social capital, and psychological capital, but does not explicitly include digital responsibility. This study suggests that digital responsibility should be regarded as an emerging form of career capital, particularly in workplace environments where data security and cyber ethics are increasingly important.

7.4 Systemic Implications of the Absence of a "High Importance-High Performance" Quadrant

One of the most striking findings of the IPA analysis in this study is that no dimension fell into the "Keep Up the Good Work" (High Importance—High Performance) quadrant. This finding warrants in-depth discussion. From a systems theory perspective, this suggests that current digital literacy education in vocational colleges may be in a state of "comprehensive suboptimality"—none of the dimensions have reached the ideal level of

development. Specifically, digital application and digital responsibility belong to the "High Importance—Low Performance" quadrant requiring urgent improvement; digital awareness falls into the "Low Importance—High Performance" quadrant indicating possible overkill; and digital knowledge and skills belong to the "Low Importance—Low Performance" quadrant as a low priority. This reveals a structural problem: a systematic mismatch exists between the allocation of cultivation resources in vocational colleges and the actual demands of the labor market. The dimension receiving the most investment (digital awareness) has a limited marginal contribution to employability, while the dimensions with the greatest contributions (application and responsibility) are under-resourced. This mismatch may arise from two mechanisms. First, vocational education has long followed a path dependence of "knowledge transmission first," regarding the achievement of cognitive benchmarks as teaching success while neglecting the complexity of capability transformation. Second, "soft" competencies such as digital responsibility are difficult to quantify and assess, making them prone to marginalization when resources are limited. This finding carries clear implications for policymakers: merely increasing total investment in digital literacy education may have limited effect; the key lies in adjusting the internal structure, shifting resources from "cognitive inculturation" toward "practice empowerment" and "responsibility internalization."

7.5 Implications for Resource Optimization of Digital Awareness and Digital Knowledge & Skills

In contrast, the high score but relatively low importance contribution of digital awareness, coupled with the "double low" (low importance and low performance) of digital knowledge and skills, jointly point to a conclusion: there may be a certain degree of resource misallocation in current digital literacy education in vocational colleges. Over-investment in awareness-raising and basic knowledge transmission, while failing to allocate resources precisely to the application and responsibility dimensions that have higher marginal effects on improving employability, may be one reason for the low efficiency of cultivation. This does not mean that digital awareness and basic knowledge are unimportant; rather, it advocates for recalibrating their weight in the cultivation curriculum—shifting from a model of "stand-alone instruction with substantial class hours" to a supporting role of "embedded in application scenarios and called upon as needed."

8. Theoretical Contribution and Practical Implications

8.1 Theoretical Contribution

At the theoretical level, this study breaks away from the research tradition that treated digital literacy as a unidimensional construct (Marsh, 2021; Sadık Tatlı et al., 2023). By empirically examining the differential impacts of its multidimensional structure, it deepens the understanding of the mechanism behind "how digital literacy affects employability." The study reveals the importance of "internal structural balance," providing an analytical framework for future research to shift from a "level-oriented" to a "structure-oriented" perspective. Furthermore, this study, for the first time, empirically validates the independent predictive effect of the digital responsibility dimension on employability among the population of vocational college students in Western China, advancing digital ethics and security awareness from the level of normative advocacy to empirical quantification, thereby extending the scope of the Employability Capital Growth Model (Donald et al., 2024).

8.2 Practical Implications

At the practical level, the IPA analysis provides a clear roadmap for reform in vocational colleges.

First, focus on the "Concentrate Here" quadrant. Teaching resources and curriculum reform must be centrally focused on digital application and digital responsibility. There should be a strong emphasis on developing practical courses based on authentic work projects, and systematically integrating digital ethics, information security, and regulatory education into professional instruction to achieve "mastery of both skill and principle."

Second, optimize the "Possible Overkill" quadrant. For the cultivation of digital awareness, which has already reached a relatively high level, efficacy evaluations should be conducted. Its teaching content should evolve from mere "awareness" to deepening "how to guide practice and responsible behavior," facilitating the transfer of cognition into action.

Third, strategically manage the "Low Priority" quadrant. As a foundational module, the teaching of digital knowledge & technology should adhere to the principle of "sufficiency and applicability." It should be treated more as integrated content supporting the cultivation of application and responsibility competencies, rather than an isolated body of knowledge for transmission.

8.3 Implications for National Policy

This study cites *China's Action Outline for Enhancing the Digital Literacy and Skills of the Whole People* (2021) as the policy background. Based on the above findings, it is necessary to reflect on the implementation priorities of this policy. Current national-level digital literacy strategies primarily focus on enhancing the public's digital awareness and basic skills popularization, exhibiting a tendency of "emphasizing cognition while neglecting application" in terms of fund allocation, project setup, and assessment indicators. The IPA analysis of this study reveals a structural mismatch at the vocational college level characterized by "over-investing in awareness while neglecting application and responsibility," which may be related to a deviation in national policy orientation. Specifically, if policy assessment is based primarily on cognitive indicators such as training coverage and knowledge test pass rates, it will incentivize grassroots institutions to prioritize the awareness dimension—which yields "easily visible results"—while avoiding the application and responsibility dimensions, which require high investment but yield slow results. Therefore, it is recommended that policymakers, when subsequently revising the Action Outline, add operational assessment indicators targeting digital application ability and ethical behavior (e.g., project work review, data security behavior assessment), and tilt fund allocation toward practical teaching and ethics education, so as to break the deadlock of "policy advocating balance, grassroots implementation imbalanced."

9. Research Limitations and Future Directions

9.1 Research Limitations

First, the data in this study were derived from student self-reports, which may be subject to social desirability bias. Future research could incorporate other ratings (e.g., teacher evaluations, internship supervisor evaluations) or behavioral data (e.g., digital

platform operation logs) for cross-validation. Second, the sample was concentrated in vocational colleges in Western China; the generalizability of the conclusions needs further testing across different regions (e.g., eastern coastal areas) and cultural contexts. Third, this study employed a cross-sectional design and cannot infer causality. Future research could adopt longitudinal tracking to reveal the dynamic processes of development in various dimensions of digital literacy and their impact on employability. Fourth, the employability scale used in this study was synthesized from multiple sources (Zhang, 2020; Wang, 2006; Shen & Ye, 2024; Han, 2014). Although reliability testing and confirmatory factor analysis were conducted, criterion-related validity was not established against objective employment outcomes (e.g., first job salary, post-entry performance ratings, employment stability). This methodological limitation may affect the confidence with which conclusions about employability can be drawn, and subsequent research should supplement evidence of criterion-related validity.

9.2 Future Directions

In addition to the improvement directions corresponding to the above limitations, future research can also be expanded in the following more specific directions:

(a) Experimental or quasi-experimental studies: Design curriculum interventions targeting digital application ability (e.g., digital training modules based on real enterprise projects) and adopt a pretest-posttest control group design to examine whether the intervention significantly improves students' self-rated employability and objective employment outcomes.

(b) Employer-side surveys: Conduct questionnaires or interviews with human resource managers of recruiting companies to validate whether the dimensions identified as "high importance" by students in this study (digital application and digital responsibility) are indeed prioritized by employers as criteria for hiring, thereby establishing a model of competency perception consistency between supply and demand.

(c) Cross-cultural or cross-regional comparative studies: Apply the IPA framework adopted in this study to different educational systems (e.g., German dual-system vocational education, American community colleges) or different countries (e.g., regions undergoing digitalization in Southeast Asia, Africa) to examine whether the "cognition-practice-responsibility" imbalance pattern is cross-culturally universal or exhibits specific institutional dependence characteristics.

(d) Intervention mechanism studies on digital responsibility cultivation: Given that the digital responsibility dimension scores the lowest but has strong predictive power, future research could develop targeted course modules such as case-based teaching, ethical dilemma simulations, and security behavior drills, and evaluate their effectiveness through randomized controlled trials.

10. Conclusion

This study demonstrates that the structural contradiction of "knowing without doing" in vocational college students' digital literacy is key to why their cognitive advantage fails to translate into competitive advantage in employment. Vocational education must shift from an extensive approach focused on "enhancing literacy levels" to

a targeted strategy of "optimizing the literacy structure." Particularly, it is crucial to address the key shortcomings in the "high-importance, low-performance" dimensions to genuinely empower students and enable them to gain lasting competitiveness in the digital economy's job market. Meanwhile, national-level digital literacy policies should rethink the current logic of resource allocation, avoiding channeling most investment into awareness popularization that "yields quick results but has low marginal contribution." Instead, by optimizing assessment indicators and fund allocation, policies should guide institutions to genuinely implement the cultivation of digital application ability and ethical responsibility.

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12. References

Al-Hattami, H. M. (2025). Understanding how digital accounting education fosters innovation: The moderating roles of technological self-efficacy and digital literacy. *International Journal of Management Education*, 23(2). https://doi.org/10.1016/j.ijme.2025.101131

Acemoglu, D., & Restrepo, P. (2017). The race between machine and man: Implications of technology for growth, factor shares and employment. Preprint. https://doi.org/10.2139/ssrn.2781320

Asiati, D., Aji, G. B., Ningrum, V., Ngadi, N., Triyono, T., Kurniawan, F. E., Aruan, N. L., & Purba, Y. A. (2018). Employment opportunities and human resources development in digital era: A case study in industrial sector. *Journal of Indonesian Social Sciences and Humanities*, 8(2), 159–168. https://doi.org/10.14203/jissh.v8i2.138

Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal*, 42(4), 921–932. https://doi.org/10.1108/ER-07-2019-0274

Beveridge, W. H. B. B. (1912). *Unemployment: A problem of industry*. Longmans, Green.

Cai, Y. (2024). *Measurement of digital literacy levels among secondary vocational students and its influencing factors* [Master's thesis, Nanchang University]. China National Knowledge Infrastructure. https://doi.org/10.27232/d.cnki.gnchu.2024.004704

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences (3rd ed.)*. Routledge. https://doi.org/10.4324/9780203774441

Donald, W. E., Baruch, Y., & Ashleigh, M. J. (2024). Construction and operationalisation of an Employability Capital Growth Model (ECGM) via a systematic literature review (2016–2022). *Studies in Higher Education*, 49(1), 1–15. https://doi.org/10.1080/03075079.2023.2219270

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93–106.

Fan, L., & Yan, Q. (2026). AI empowering the cultivation of applied accounting talents: Value, challenges, and implementation paths—Based on the perspective of enhancing professional competence and digital literacy. *Modern Vocational Education*, (04), 53–56.

Feng, X. L., Su, J. N., & Qiu, Y. (2024). The impact of employability on the choice of slow employment among college graduates. *Population and Economy*, 5, 78–91.

Gilster, P. (1997). *Digital literacy. Wiley Computer Pub*.

Guilbert, L., Bernaud, J.-L., Gouvernet, B., & Rossier, J. (2016). Employability: Review and research prospects. *International Journal for Educational and Vocational Guidance*, 16(1), 69–89.
https://doi.org/10.1007/s10775-015-9288-4

Han, C. X. (2014). *Research on the construction of structural model of college students' core competitiveness in employment* [Master's thesis, Dalian University of Technology]. https://kns.cnki.net/KCMS/detail/detail.aspx?dbcode=CMFD&dbname=CMFD201502&filename=1015569019.nh

Harvey, L. (2001). Defining and measuring employability. *Quality in Higher Education*, 7(2), 97–109.
https://doi.org/10.1080/13538320120059990

Jiang, T., & Yang, Z. S. (2023). Logic, vision, and path of digital transformation of vocational education in western China. Ethnic Education Research, 34(6), 76–83.

Jiang, X. D., Que, M. K., & Wang, F. (2024). Classification characteristics and paradigm change of college students' employability. *Research in Educational Development*, 44(7), 9–16.

Li, D. G. (2012). Digital literacy: New trends in media literacy education under the background of the new digital divide. *Ideological and Theoretical Education*, 18, 9–13.

Li, G. Y. (2026). Research on the current situation and enhancement strategies of digital literacy among vocational college students majoring in preschool education—A case study of 7 vocational colleges in H Province. *Modern Vocational Education*, (03), 65–68.

Liu, C., Lu, L., & Wang, L. (2025). Research on the path to enhance the employability of college students in the digital era. *Talent Development and Employment*, (S1), 68–71.

Lu, J. T. (2023). *Research on the three-dimensional path of digital economy driving high-quality economic development in China* [Doctoral dissertation, Party School of the Central Committee of the Communist Party of China (National Academy of Governance)]. https://kns.cnki.net/KCMS/detail/detail.aspx?dbcode=CDFD&dbname=CDFDTEMP&filename=1023110819.nh

Lyu, Y., & Luo, J. (2024). The relationship between digital literacy and job performance of university teachers: The chain mediating effect of psychological empowerment and job satisfaction. *Current Psychology*, 43(45), 34496–34510. https://doi.org/10.1007/s12144-024-06971-w

Marsh, E. (2018). Understanding the effect of digital literacy on employees' digital workplace continuance intentions and individual performance. *International Journal of Digital Literacy and Digital Competence (IJDLDC)*, 9(2), 15–33.

Martilla, J. A., & James, J. C. (1977). Importance-performance analysis. *Journal of marketing*, 41(1), 77-79.

Martin, A. (2008). Digital literacy and the "digital society". *Digital literacies: Concepts, policies and practices*, 30(151), 1029–1055.

McQuaid, R. W., & Lindsay, C. (2005). The Concept of Employability. *Urban Studies*, 42(2), 197–219. https://doi.org/10.1080/0042098042000316100

Milenkova, V., & Lendzhova, V. (2021). Digital Citizenship and Digital Literacy in the Conditions of Social Crisis. *Computers*, 10(4), Article 4. https://doi.org/10.3390/computers10040040

Mohammadyari, S., & Singh, H. (2015). Understanding the effect of e-learning on individual performance: The role of digital literacy. *Computers & Education*, 82, 11–25. https://doi.org/10.1016/j.compedu.2014.10.025

Pilav-Velić, A., Černe, M., Trkman, P., Wong, S. I., & Abaz, A. K. (2021). Digital or Innovative: Understanding "Digital Literacy – Practice – Innovative Work Behavior" Chain. *South East European Journal of Economics and Business*, 16(1), 107–119. https://doi.org/10.2478/jeb-2021-0009

Pirzada, K., & Khan, F. (2013). *Measuring Relationship between Digital Skills and Employability*. https://papers.ssrn.com/abstract=2382939

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Pu, X. S., & Cao, P. J. (2025). Can technology empower students' digital literacy? A large-scale survey of digital learning status in primary and secondary schools. Modern Educational Technology, 35(1), 98–108.

Robinson, J. P. (2000). What are employability skills. *The workplace*, 1(3), 1–3.

Ruan, R. H., & Luo, M. Z. (2024). Digital literacy, employability, and non-agricultural employment of rural labor. *Journal of Hunan Agricultural University (Social Sciences)*, 25(4), 31–39.

Sadik Tatli, H., Sefa Yavuz, M., & Ongel, G. (2023). The Mediator Role of Task Performance in the Effect of Digital Literacy on Firm Performance. *Marketing and Management of Innovations*, 14(2), 75–86. https://doi.org/10.21272/mmi.2023.2-08

Shen, T., & Ye, Y. H. (2024). College students' sustainable employability: Structural model, assessment tools, and applications. *Contemporary Education Forum*, 6, 43–52.

Song, W. (2021). *Fundamentals and practice of statistics. Dalian University of Technology Press*.

Tan, J. (2023). Research on Employment Survey of Vocational College Graduates. *International Journal of Education and Humanities*, 11(3), Article 3. https://doi.org/10.54097/ijeh.v11i3.14913

Tao, J. X., & Ma, X. Y. (2025). The current situation and improvement paths of vocational college students' employability under the background of the digital economy. *Vocational Education Communication*, (10), 78–84.

Umardiyah, F., & Amaliah, I. N. (2021). Development of Self-Learning Media through Digital Literacy in Arithmetic Line Lessons. *Jurnal Pendidikan Matematika*, 14(2), 123–132.

Victoria, O. I., & Juliana, I.-J. (2012). Influence of digital literacy on career progression and work motivation of academic library staff in South-West, Nigeria. *Library Philosophy and Practice (e-journal)*, 1–24.

Wang, H., & Jiao, R. (2023). The relationship between career social support and Career management ability: The mediating role of career decision-making self-efficacy. *Current Psychology*, 42(26), 23018–23027. https://doi.org/10.1007/s12144-022-03418-y

Wang, Y. (2006). *A study on the relationship among college students' career values, employability, and employment performance* [Master's thesis, Zhejiang University]. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=cmfd&dbname=cmfd2007&filename=2007014410.nh

Yang, J. P., & Chen, L. (2025). Research on the construction of a digital literacy framework and cultivation pathways for high-skilled talents based on the KSAO model. *Journal of Chang'an University (Social Science Edition)*, 27(6), 15–29.

Yang, Q., & Chen, J. (2024). Research on the construction of a digital literacy cultivation system for vocational college students in the digital era. *Mechanical Vocational Education*, (09), 33–37. https://doi.org/10.16309/j.cnki.issn.1007-1776.2024.09.008

Yang, X. Y. (2026). Cultivation of college students' digital literacy: Value, dilemmas, and practical approaches. *Journal of Hubei Open Vocational College*, 39(1), 30–32.

Zhang, H. L. (2020). *The impact of perceived social support on the employability of higher vocational students: The mediating role of psychological capital* [Master's thesis, Central China Normal University]. https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=cmfd&dbname=cmfd202101&filename=1020127927.nh

Zhang, W. (2006). A research-based evaluation model of English digital literacy. *Foreign Language Teaching and Research*, 2, 115–121, 161.

Zhao, Y. Z. (2025). Research on the impact of digital literacy education in vocational colleges on the enhancement of students' employability. *Modern Youth*, (09), 84–86.