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An Empirical Study on the Influencing Factors of Digital Citizenship Literacy—Based on a Survey of Students and Teachers in Vocational Colleges in Fujian Province

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Abstract

In the context of rapid digital transformation and the advancement of the Digital China strategy, digital citizenship literacy (DCL) has become a critical competency for workforce readiness and sustainable societal development. Despite the growing recognition of its importance, existing studies predominantly conceptualize DCL either as a set of technical skills or as a normative framework of responsible behavior, often overlooking its multidimensional and interactive nature . Moreover, empirical research focusing on vocational college students remains limited. Drawing on Social Cognitive Theory（Bandura, 1986） , this study develops an integrated analytical framework encompassing personal, behavioral, and environmental dimensions to examine the antecedents of DCL. A quantitative research design was employed, collecting data from 843 students and 215 teachers across 10 vocational colleges in Fujian Province, China. Data were analyzed using descriptive statistics, correlation analysis, and multiple linear regression. The results indicate that, at the personal level, students' computer self-efficacy and internet attitudes significantly enhance DCL. At the behavioral level, interpersonal communication skills, social media proficiency, and 21st-century digital skills positively predict DCL. At the environmental level, perceived organizational support and teachers' internet self-efficacy exert significant positive effects, whereas teachers' IT usage and internet anxiety show no significant influence. This study demonstrates that DCL is a dynamic, multi-system outcome shaped by the interaction of individual cognition, behavioral practices, and environmental support. This research provides both theoretical advancement and practical implications for designing targeted digital literacy interventions in vocational education.

Keywords: Digital China, Digital Citizenship Literacy, Influencing Factors, Vocational Education, Empirical Study

Background and Problem Statement

With the rapid expansion of the digital economy and the implementation of national strategies such as Digital China, digital citizenship literacy (DCL) has evolved into a foundational competency for individuals' participation in digital society and for enhancing

national competitiveness. DCL extends beyond basic digital skills to encompass ethical awareness, critical thinking, and responsible participation in digital environments (Choi, 2016; Ribble, 2011).

For students in vocational colleges, DCL is particularly crucial because their future roles are closely linked to technology-intensive industries and practical work environments. Unlike general higher education, vocational education emphasizes applied skills, workplace integration, and real-world problem solving. Therefore, insufficient DCL among vocational students may directly hinder their employability, adaptability, and long-term career development.

However, a notable phenomenon has emerged: although vocational students are often considered “digital natives,” their digital competencies are unevenly developed. Prior studies have identified a paradox characterized by high operational skills but low levels of critical awareness, ethical responsibility, and digital judgment (Ng, 2012; van Dijk, 2020). This imbalance raises concerns about whether current educational practices adequately support the holistic development of digital citizenship.

Research Gap

Despite increasing scholarly attention to digital literacy and digital citizenship, several limitations remain in the existing literature.

First, conceptual fragmentation persists. Some studies emphasize technical access and skills (Mossberger et al., 2007), while others focus on norms, ethics, and responsible behavior (Ribble, 2011). Few studies integrate these perspectives into a comprehensive framework that reflects the complexity of DCL.

Second, empirical evidence focusing on vocational education contexts is insufficient. Most prior research has concentrated on general university students or broader populations, neglecting vocational students who play a critical role in the digital workforce.

Third, limited attention has been paid to multi-level influencing mechanisms. Existing studies tend to examine isolated factors (e.g., skills or attitudes) rather than exploring the interactive effects of personal cognition, behavioral practices, and environmental support systems.

Finally, theoretical application remains underdeveloped. While digital literacy research has expanded, there is a lack of studies grounded in robust theoretical frameworks such as Social Cognitive Theory, which emphasizes the dynamic interaction among personal, behavioral, and environmental factors (Bandura, 1986).

Purpose and Contribution of the Study

To address these gaps, this study develops an integrated analytical framework based on Social Cognitive Theory and Ecosystem Theory, incorporating:Personal factors (students’ computer self-efficacy, students’ internet attitudes)Behavioral factors (students’ interpersonal communication, students social media skills, digital skills in the 21st-century)Environmental factors (teachers' use of information technology, teachers' self-efficacy in using the internet, teachers' internet anxiety, sense of school organizational support).Using large-scale survey

data from vocational colleges in Fujian Province, this study aims to systematically examine the relative effects and mechanisms of these factors on students' DCL.

Significance of the Study

This study holds important theoretical, empirical, and practical significance in advancing the understanding and cultivation of digital citizenship literacy (DCL) in vocational education contexts.

First, in terms of theoretical significance, this study contributes to the existing body of knowledge by conceptualizing DCL as a dynamic and multi-dimensional construct shaped by the interaction of personal, behavioral, and environmental factors. While prior research has tended to adopt either a skills-oriented perspective (Mossberger et al., 2007) or a normative and ethical perspective (Ribble, 2011), this study integrates these fragmented approaches within a unified analytical framework grounded in Social Cognitive Theory (Bandura, 1986). By doing so, it extends the application of triadic reciprocal determinism to the domain of digital citizenship, offering a more comprehensive explanation of how DCL develops in complex educational ecosystems.

Second, in terms of empirical significance, this study addresses a critical gap in the literature by focusing on vocational college students, a population that has been largely underrepresented in digital literacy research. Using large-scale quantitative data from both students and teachers across multiple institutions, this study provides robust empirical evidence on the key determinants of DCL. The inclusion of multi-source data enhances the reliability and explanatory power of the findings, thereby enriching the empirical foundation for future research in this field.

Third, in terms of practical significance, the findings offer actionable insights for policymakers, educators, and institutional leaders seeking to enhance digital citizenship education. By identifying key influencing factors—such as students' computer self-efficacy, social media skills, and perceived organizational support—this study highlights critical intervention points for improving educational practices. Specifically, it underscores the need to strengthen students' internal motivation and competencies, optimize institutional support systems, and leverage teachers' roles as facilitators of digital learning environments.

Finally, in terms of policy relevance, this study aligns with national and global initiatives aimed at promoting digital literacy and workforce readiness in the digital era. The findings provide evidence-based support for policy frameworks such as the Digital China strategy, offering practical guidance for cultivating digitally competent and socially responsible talent in vocational education systems.

Literature Review and Theoretical Framework

Digital Citizenship Literacy: From Concept to Operationalization

Digital Citizenship Literacy, as a core component of civic literacy in the information age, has seen its connotations continuously deepen alongside the evolution of digital technology and shifts in societal needs. The classic framework proposed by Ribble (2015) defines Digital Citizenship Literacy as "the set of knowledge, skills, and attitudes required for individuals to participate responsibly, ethically, safely, and effectively in social life and professional activities

within a digital society." This concept emphasizes the ethical dimension and social responsibility of digital participation, laying a theoretical foundation for subsequent research. Within the context of vocational education, Digital Citizenship Literacy relates not only to general digital survival skills but is also closely intertwined with the application of technology in professional settings, collaborative innovation, and lifelong learning capabilities (Holland, 2021). Therefore, aligning with the practice-oriented nature of vocational education, this study operationalizes Digital Citizenship Literacy into five key dimensions:

Internet Political Participation: Refers to the ability to engage in public affairs discussions, social actions, or policy advocacy through digital platforms, reflecting the level of a citizen's digital social engagement (Kahne et al., 2016).

Professional Skills: Encompasses media literacy levels, the ability to apply open-source intelligence, and the effective use of digital tools to solve problems in professional scenarios, reflecting technological adaptability in vocational contexts (van Laar et al., 2017).
Local/Global Awareness: Refers to the ability, during information consumption and dissemination, to balance local context with a global perspective, and to handle cross-cultural digital issues in accordance with information ethics (Mossberger et al., 2020).

Critical Perspective: Emphasizes the capacity for reflection on and reconstruction of digital content, online interaction patterns, and the societal impact of the internet. This is central to resisting information manipulation and fostering rational participation (Livingstone, 2021).
Interpersonal Networks: Focuses on the ability to establish, maintain, and expand professional and social relationships through digital media, covering information literacy and relationship management skills (Jones & Mitchell, 2016).

This operational framework responds to the universal requirements of digital citizenship literacy while highlighting the specific needs of vocational education, such as technology integration, collaboration orientation, and professional adaptation.

A Multidimensional Perspective on Influencing Factors: An Integrated Theoretical Framework
To systematically analyze the mechanisms influencing Digital Citizenship Literacy, this study integrates Social Cognitive Theory (Bandura, 1986) and Ecological Systems Theory (Bronfenbrenner, 1979) to construct an integrated analytical framework encompassing three dimensions: individual, behavioral, and environmental. This framework emphasizes that the formation of digital literacy is the result of dynamic interactions among individual cognition, behavioral practices, and the external environment.

Individual Factors: The Role of Intrinsic Psychological Drivers
Individual factors form the psychological foundation for the development of digital literacy. Among these, Computer Self-Efficacy, a core construct of Social Cognitive Theory, refers to an individual's belief in their ability to use computers to complete specific tasks (Compeau & Higgins, 1995). Research indicates that students with high self-efficacy are more willing to attempt complex digital tasks and demonstrate greater resilience when facing technological challenges (Tsai et al., 2019a). Another key variable is Internet Attitude, which refers to students' subjective evaluation and emotional disposition towards the value of the internet. A positive internet attitude can stimulate exploratory use behaviors and promote the active

construction of digital skills (Zhang & Zhu, 2021). In vocational education, students' sense of identification with and confidence in technology directly influence their willingness and effectiveness in applying digital tools to real-world work scenarios.

Behavioral Factors: Capability Demonstration in Digital Practice

The essence of digital literacy is manifested in specific behaviors. This study focuses on three key behavioral factors:

Interpersonal Communication Skills: As an extension of offline social intelligence, these skills help students build trust, engage in effective collaboration, and manage conflicts within digital environments. They serve as an important foundation for online professional collaboration (Jones & Mitchell, 2016).

Social Media Competence: Specifically refers to the ability to filter information, create content, maintain relationships, and shape a personal brand on social platforms. This is a direct manifestation of digital participation and a key channel for expanding professional networks (van Laar et al., 2017).

21st Century Digital Skills: Encompass comprehensive abilities such as information management, critical thinking, online safety protection, and cross-cultural digital collaboration. Acting appropriately and avoiding potential harm in digital environments has become an indispensable part of Digital Citizenship Literacy (Voogt & Roblin, 2012).

These behavioral factors not only reflect an individual's level of digital capability but also further shape their self-perception and attitudes through feedback from practice.

Environmental Factors: Support and Influence of External Systems

Environmental factors constitute the external ecosystem for the development of digital literacy. Within the microsystem, teachers play a pivotal role:

Teacher Internet Self-Efficacy: Refers to teachers' confidence in their ability to effectively use the internet for teaching and professional development. Teachers with high self-efficacy are more inclined to integrate digital resources into their classrooms and model advanced digital practices, thereby subtly enhancing students' digital literacy (Hatlevik & Hatlevik, 2018a).

Teacher ICT Use: Its impact may be context-dependent. Appropriate, high-quality technology integration can provide learning scaffolding, but mechanical or infrequent use may not yield significant promoting effects (Tondeur et al., 2022).

Teacher Internet Anxiety: Refers to teachers' feelings of tension or avoidance regarding internet use. Teachers with high anxiety may shy away from digital teaching, indirectly affecting students' opportunities to engage with digital practices (Wang et al., 2023). However, its direct impact on students' digital literacy remains to be empirically tested.

At the macrosystem level, Perceived Organizational Support is crucial. It reflects the degree of support provided by the school in areas such as investment in digital infrastructure, relevant curriculum design, teacher training, and fostering an innovative culture. Strong organizational support can provide resource guarantees and institutional incentives for the development of students' digital literacy (Zheng et al., 2016).

In summary, the theoretical framework of this study (as shown in Figure 1) hypothesizes that students' Digital Citizenship Literacy is jointly influenced by individual factors (Computer Self-Efficacy, Internet Attitude), behavioral factors (Interpersonal Communication Skills, Social Media Competence, 21st Century Digital Skills), and environmental factors (Teacher Internet Self-Efficacy, Teacher ICT Use, Teacher Internet Anxiety, Perceived Organizational Support). Furthermore, complex interactions may exist among these factors. By testing this integrated model, this study aims to reveal the multi-level generative mechanisms of Digital Citizenship Literacy among vocational college students, providing a theoretical basis for formulating targeted intervention strategies.

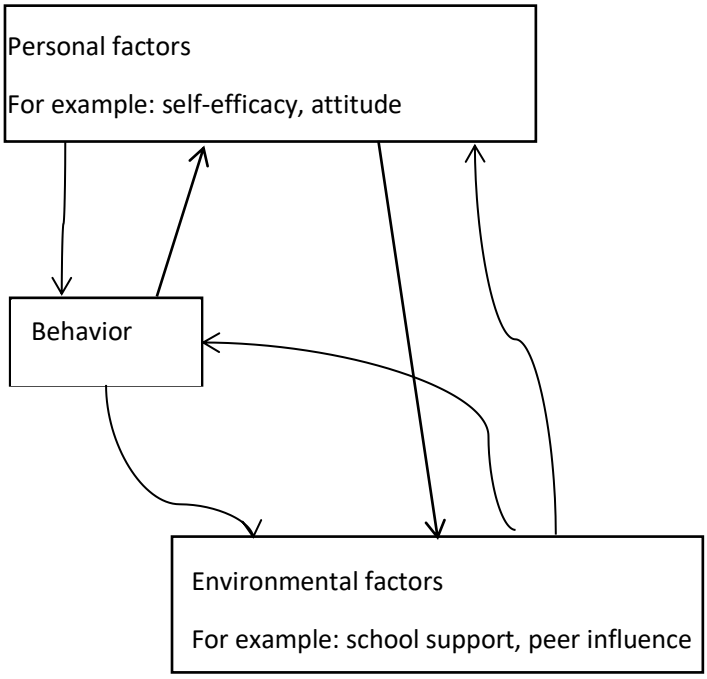

Figure 1: Ternary interaction Relationship

Based on the triadic reciprocal relationship, we have established the following analytical model,as shown in Figure 2-4.

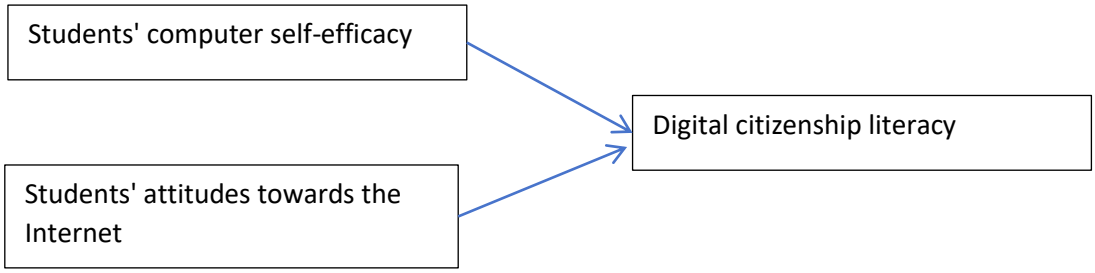

Figure2: A model of influencing factors of students' digital citizenship literacy at the individual level

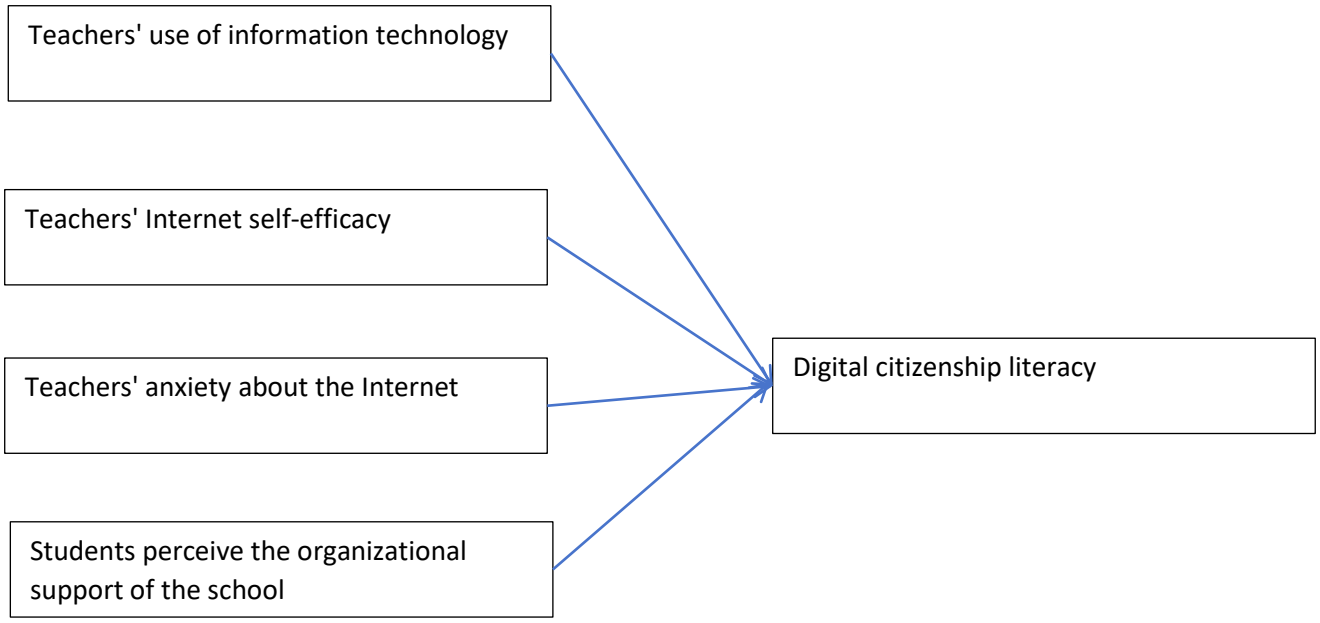

Figure3:A model of influencing factors at the environmental level of College students' digital Citizenship literacy

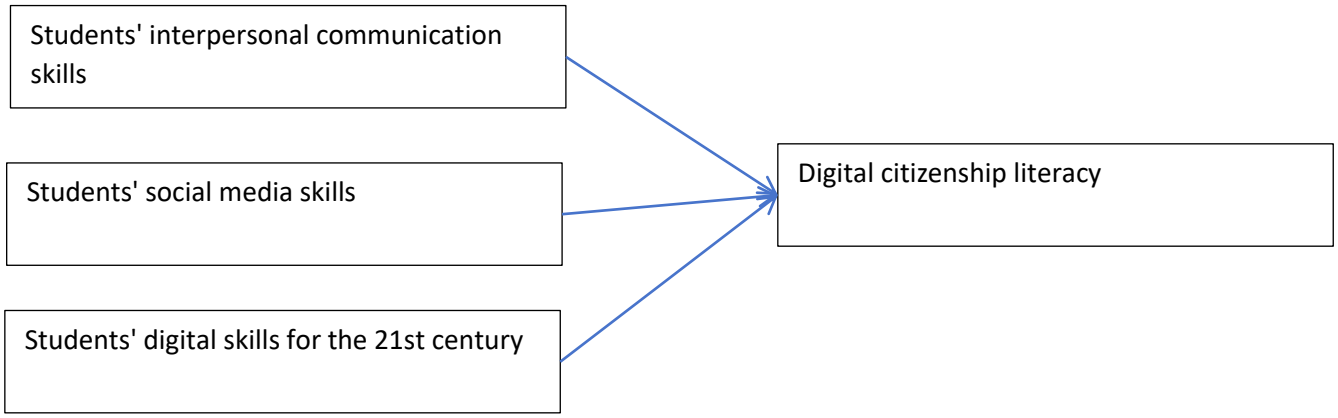

Figure4：A model of influencing factors at the behavioral level of digital Citizenship literacy among college students

Research Design

Sample and Data Collection

This study's survey scope encompasses both comprehensive and specialized higher education institutions, including both public and private colleges. To account for potential regional disparities in educational informatization levels, the study includes institutions from both provincial capital cities and non-capital cities, ensuring broader applicability and representativeness of the findings. The survey participants consist of full-time students in local vocational colleges, spanning their first to third years (all vocational education programs in China follow a three-year system). The sample covers a diverse range of disciplines,

including engineering, science, arts, education, and others, encompassing both humanities and social sciences as well as natural sciences. Ultimately, 806 valid student questionnaires and 206 valid teacher questionnaires were collected, with effective response rates of 95.8% and 95.6%, respectively. Among the student sample, 41.56% were male and 58.44% were female. In the teacher sample, 40.29% were male and 59.71% were female.

Measurement Tools

All scales employed a 5-point Likert scoring system (1 = strongly disagree, 5 = strongly agree) and demonstrated good reliability and validity in the pilot test.

Dependent Variable: Digital Citizenship Literacy Scale, (Choi 2016), comprising 16 items. In this study, Cronbach's α = 0.86.

Independent Variables:

Personal Factors: Computer Self-Efficacy Scale (Compeau & Higgins, 1995; α = 0.88); Internet Attitude Scale (Tsai et al., 2019b; α = 0.85).

Behavioral Factors: Interpersonal Communication Skills Scale (Spitzberg, 2006; α = 0.90); Social Media Proficiency Scale (van Laar et al., 2017; α = 0.87).

Environmental Factors: Teacher Internet Self-Efficacy Scale (Hatlevik & Hatlevik, 2018b; α = 0.89); Perceived Organizational Support Scale (Eisenberger et al., 1986; α = 0.91); Teacher Information Technology Usage Scale (European Commission, 2017); Teacher Internet Anxiety Scale (Teacher Internet Anxiety Scale (Heinssen et al., 1987)

Data Analysis Strategy

SPSS 26.0 was used to conduct tests for common method bias, descriptive statistics, and Pearson correlation analysis. Mplus 8.3 was employed for confirmatory factor analysis to examine discriminant validity and to perform multiple linear regression analysis.

Research Results

Descriptive Statistics of Student Questionnaires

Table 1

Summary Table of Cronbach's Reliability Analysis Results of the Digital Citizen Competence Scale

Cronbach's Reliability Analysis				
	Item	**Corrected Item-Total Correlation (CITC)**	**Cronbach's Alpha if Item Deleted**	**Cronbach's Alpha**
Computer Self-Efficacy	CSE1	0.769	0.898	0.912
	CSE2	0.671	0.904	
	CSE3	0.653	0.905	
	CSE4	0.683	0.903	
	CSE5	0.673	0.904	
	CSE6	0.633	0.906	
	CSE7	0.696	0.902	
	CSE8	0.675	0.904	
	CSE9	0.653	0.905	
	CSE10	0.675	0.904	

Internet Attitude	IA1	0.743	0.862	0.888
	IA2	0.695	0.87	
	IA3	0.677	0.873	
	IA4	0.696	0.87	
	IA5	0.684	0.872	
	IA6	0.73	0.865	
Interpersonal Communication Skills	ICS1	0.774	0.854	0.886
	ICS2	0.686	0.869	
	ICS3	0.683	0.869	
	ICS4	0.686	0.869	
	ICS5	0.682	0.869	
	ICS6	0.69	0.868	
Technology Use	SMS-A1	0.594	0.626	0.742
	SMS-A2	0.551	0.676	
	SMS-A3	0.559	0.667	
Content Analysis	SMS-B1	0.69	0.869	0.887
	SMS-B2	0.682	0.87	
	SMS-B3	0.713	0.865	
	SMS-B4	0.685	0.87	
	SMS-B5	0.713	0.865	
	SMS-B6	0.723	0.864	
Anticipated Feedback	SMS-C1	0.667	0.821	0.852
	SMS-C2	0.682	0.816	
	SMS-C3	0.629	0.83	
	SMS-C4	0.657	0.823	
	SMS-C5	0.68	0.817	
IT Infrastructure Development	SOS-A1	0.678	0.733	0.815
	SOS-A2	0.677	0.734	
	SOS-A3	0.642	0.769	
IT Resource & Application Development	SOS-B1	0.708	0.854	0.879
	SOS-B2	0.693	0.857	
	SOS-B3	0.701	0.856	
	SOS-B4	0.752	0.843	
	SOS-B5	0.702	0.855	
IT Management & Service Support Mechanism Development	SOS-C1	0.804	0.91	0.919
	SOS-C2	0.861	0.863	
	SOS-C3	0.844	0.877	
Online Political Participation	DL-A1	0.642	0.776	0.82
	DL-A2	0.621	0.782	
	DL-A3	0.594	0.79	
	DL-A4	0.601	0.788	
	DL-A5	0.601	0.788	
Professional Skills	DL-B1	0.67	0.819	0.843
	DL-B2	0.737	0.754	
	DL-B3	0.72	0.772	
Local/Global Awareness	DL-C1	0.667	-	0.8
	DL-C2	0.667	-	
Critical Perspective	DL-D1	0.733	0.775	0.849

	DL-D2	0.723	0.785	
	DL-D3	0.698	0.808	
Interpersonal Networks	DL-E1	0.685	0.796	0.84
	DL-E2	0.708	0.773	
	DL-E3	0.717	0.764	
21st-Century Digital Skills	SCDS1	0.886	0.939	0.947
	SCDS2	0.714	0.944	
	SCDS3	0.687	0.944	
	SCDS4	0.702	0.944	
	SCDS5	0.711	0.944	
	SCDS6	0.698	0.944	
	SCDS7	0.703	0.944	
	SCDS8	0.699	0.944	
	SCDS9	0.702	0.944	
	SCDS10	0.697	0.944	
	SCDS11	0.713	0.944	
	SCDS12	0.702	0.944	
	SCDS13	0.702	0.944	
	SCDS14	0.705	0.944	
	SCDS15	0.717	0.944	

As shown in Table 1 above, it can be observed that the CITC (Corrected Item-Total Correlation) values for all items in the questionnaire are greater than 0.5, indicating that most items in this questionnaire exhibit a strong correlation with the overall scale, and the designed variables demonstrate good discriminative validity.

The Cronbach's Alpha coefficients for the 15 dimensions of the scale are 0.918, 0.893, 0.891, 0.762, 0.894, 0.865, 0.823, 0.886, 0.891, 0.849, 0.862, 0.813, 0.866, 0.859, and 0.947, respectively. All values exceed 0.7, indicating strong internal consistency of the questionnaire. Therefore, the reliability of the survey results is excellent, and the data in this study have passed the reliability test.

Table 2

Summary of Statistical Analysis of Multi-Dimensional Evaluation Indicators for Students' Digital Citizenship Competence

Basic Indicators		
Indicator	**Mean**	**Standard Deviation**
Computer Self-Efficacy	3.5	0.794
Internet Attitude	3.49	0.893
Interpersonal Communication Skills	3.355	0.919
Technology Use	3.743	0.859
Content Analysis	3.697	0.895
Expected Feedback	3.71	0.865
Social Media Competence	3.712	0.733
Informatization Infrastructure Development	3.642	0.959
Informatization Resource and Application Development	3.629	0.933
Informatization Management and Service Support Mechanism Development	3.677	1.11

Perceived Organizational Support	3.645	0.816
Internet Political Activities	3.697	0.776
Professional Skills	3.686	0.996
Local/Global Awareness	3.755	1.023
Critical Perspective	3.738	0.897
Interpersonal Networks	3.74	0.927
Digital Citizenship Literacy	3.719	0.683
21st-Century Digital Skills	3.058	0.827

As shown in Table 2 above , the mean values for each dimension are as follows: Computer Self-Efficacy: 3.5； Internet Attitude: 3.49； Interpersonal Communication Skills: 3.355； Technology Use: 3.743； Content Analysis: 3.697； Anticipated Feedback: 3.71； Social Media Proficiency: 3.712 ； Information Technology Infrastructure Development: 3.642 ； Information Technology Resource and Application Development: 3.629 ； Information Technology Management and Service Support Mechanism Development: 3.677； Perceived Organizational Support: 3.645； Internet Political Engagement: 3.697； Professional Skills: 3.686； Local/Global Awareness: 3.755； Critical Perspective: 3.738； Digital Citizenship Literacy: 3.719； Interpersonal Networking: 3.74 ； 21st-Century Digital Skills: 3.058

Correlation Analysis of Student Questionnaire Data

Table 3

Pearson Correlation Analysis of Digital Citizenship Competence and Key Influencing Factors

Pearson Correlation							
	Computer Self-Efficacy	**Internet Attitude**	**Interpersonal Communication Skills**	**Social Media Competence**	**Perceived Organizational Support**	**21st-Century Digital Skills**	**Digital Citizenship Literacy**
Computer Self-Efficacy	1						
Internet Attitude	0.469**	1					
Interpersonal Communication Skills	0.455**	0.406**	1				
Social Media Competence	0.356**	0.318**	0.382**	1			
Perceived Organizational Support	0.374**	0.382**	0.377**	0.170**	1		
21st-Century Digital Skills	0.251**	0.323**	0.300**	0.163**	0.139**	1	
Digital Citizenship Literacy	0.559**	0.570**	0.509**	0.363**	0.399**	0.400**	1
*p<0.05**p<0.01							

As shown in Table 3 above, there is a significant correlation between computer self-efficacy and digital citizenship literacy, with a correlation coefficient of r = 0.559. Since the value of r

is greater than 0, this indicates a positive relationship between computer self-efficacy and digital citizenship literacy.

Similarly, a significant correlation is observed between internet attitude and digital citizenship literacy, with r = 0.570, suggesting a positive association between these two variables.
Interpersonal communication skills also demonstrate a significant positive correlation with digital citizenship literacy, with r = 0.509.
Social media proficiency shows a significant positive correlation with digital citizenship literacy, with r = 0.363.

Perceived organizational support exhibits a significant positive correlation with digital citizenship literacy, with r = 0.399.
21st-century digital skills show a significant positive correlation with digital citizenship literacy, with r = 0.400.

In summary, all the examined variables—computer self-efficacy, internet attitude, interpersonal communication skills, social media proficiency, perceived organizational support, and 21st-century digital skills—are positively correlated with digital citizenship literacy, with correlation coefficients ranging from 0.363 to 0.570.

Regression Analysis of Student Questionnaire Data
Table 4
Summary Table of Linear Regression Model Analysis Results for Factors Affecting Digital Citizenship Competence (n = 806)

Results of Linear Regression Analysis (n=806)							
Variable	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**	**Collinearity Diagnostics**	
	B	**Std. Error**	**Beta**			**VIF**	**Tolerance**
Constant	0.813	0.117	-	6.975	0.000**	-	-
Computer Self-Efficacy	0.214	0.026	0.248	8.144	0.000**	1.531	0.653
Internet Attitude	0.201	0.023	0.263	8.696	0.000**	1.510	0.662
Interpersonal Communication Skills	0.124	0.023	0.167	5.476	0.000**	1.522	0.657
Social Media Competence	0.075	0.026	0.081	2.931	0.003**	1.255	0.797
Perceived Organizational Support	0.087	0.024	0.104	3.711	0.000**	1.300	0.769
21st-Century Digital Skills	0.144	0.022	0.175	6.553	0.000**	1.167	0.857
R^2	0.514						
Adjusted R^2	0.511						
F	F (6,799)=141.091,p=0.000						
D-WValue	2.107						
Dependent Variable: Digital Citizenship Literacy							
* p<0.05** p<0.01							

As shown in Table 4 above, a linear regression analysis was conducted with computer self-

efficacy, internet attitude, interpersonal communication skills, social media proficiency, perceived organizational support, and 21st-century digital skills as independent variables, and digital citizenship literacy as the dependent variable. The model formula derived is as follows: Digital Citizenship Literacy = 0.813 + 0.214 * Computer Self-Efficacy + 0.201 * Internet Attitude + 0.124 * Interpersonal Communication Skills + 0.075 * Social Media Proficiency + 0.087 * Perceived Organizational Support + 0.144 * 21st-Century Digital Skills， the model's R-squared value is 0.514, indicating that the six independent variables collectively explain 51.4% of the variation in digital citizenship literacy. An F-test of the model shows that it passes the test ($F = 141.091$, $p = 0.000 < 0.05$), meaning that at least one of the independent variables—computer self-efficacy, internet attitude, interpersonal communication skills, social media proficiency, perceived organizational support, or 21st-century digital skills—has a significant impact on digital citizenship literacy.

Furthermore, tests for multicollinearity reveal that all Variance Inflation Factor (VIF) values in the model are below 5, indicating no significant multicollinearity issues. The Durbin-Watson (D-W) statistic is close to 2, suggesting no autocorrelation in the model and confirming that the sample data are independent, which demonstrates the robustness of the model.
The detailed analysis reveals the following:

Computer Self-Efficacy: Regression coefficient = 0.214 ($t = 8.144$, $p = 0.000 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
Internet Attitude: Regression coefficient = 0.201 ($t = 8.696$, $p = 0.000 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
Interpersonal Communication Skills: Regression coefficient = 0.124 ($t = 5.476$, $p = 0.000 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
Social Media Proficiency: Regression coefficient = 0.075 ($t = 2.931$, $p = 0.003 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
Perceived Organizational Support: Regression coefficient = 0.087 ($t = 3.711$, $p = 0.000 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
21st-Century Digital Skills: Regression coefficient = 0.144 ($t = 6.553$, $p = 0.000 < 0.01$), indicating a significant positive effect on digital citizenship literacy.
In summary, computer self-efficacy, internet attitude, interpersonal communication skills, social media proficiency, perceived organizational support, and 21st-century digital skills all have significant positive effects on digital citizenship literacy.

Correlation Analysis of Teacher Questionnaire Data

Table 5

Analysis Results of Reliability of the Scale for Teachers' Information Literacy and Students' Digital Citizenship Literacy

Cronbach's Reliability Analysis				
	Number of Items	**Sample Size**	**Cronbach's α**	**CR**
Teachers' Use of Information Technology	13	206	0.978	0.977
Teachers' Internet Self-Efficacy	17	206	0.97	0.971
Teachers' Internet Anxiety	20	206	0.981	0.982
Students' Digital Citizenship Literacy	10	206	0.913	0.913

As shown in Table 5 above, it can be seen that the Cronbach's α coefficient for teachers' information technology usage is 0.978, and the CR value is 0.977, indicating good reliability. The Cronbach's α coefficient for teachers' internet self-efficacy is 0.970, and the CR value is 0.971, also demonstrating strong internal consistency. Similarly, the Cronbach's α coefficient for teachers' internet anxiety is 0.981, and the CR value is 0.982, further confirming its reliability. The Cronbach's α coefficient for teachers' internet self-efficacy is 0.970, and the CR value is 0.971. For students' digital citizenship literacy, the Cronbach's α coefficient is 0.913, and the CR value is 0.913, also showing good internal consistency. These results suggest that the measurement tools used possess high reliability.

Table 6

Pearson Correlation Analysis of Teacher Information Technology-related Factors and Students' Digital Citizenship Competence

Pearson Correlation				
Variable	**eacher's ICT Use**	**Teacher's Internet Self-Efficacy**	**Teacher's Internet Anxiety**	**Digital Citizenship Literacy**
Teacher's ICT Use	1			
Teacher's Internet Self-Efficacy	0.559**	1		
Teacher's Internet Anxiety	-0.565**	-0.524**	1	
Student's Digital Citizenship Literacy	0.375**	0.572**	-0.386**	1
* p<0.05 ** p<0.01				

As shown in Table 6 above, a significant correlation is observed between teachers' use of information technology and students' digital citizenship literacy, with a correlation coefficient of r = 0.375. Since the value of r is greater than 0, this indicates a positive relationship between teachers' use of information technology and students' digital citizenship literacy.

Similarly, a significant correlation is observed between teachers' internet self-efficacy and

students' digital citizenship literacy, with r = 0.572, suggesting a positive association between these two variables.

In contrast, teachers' internet anxiety shows a significant negative correlation with students' digital citizenship literacy, with r = -0.386. Since the value of r is less than 0, this indicates an inverse relationship between teachers' internet anxiety and students' digital citizenship literacy.

Regression Analysis of Teacher Questionnaire Data

Table 7

Linear Regression Analysis Results of Teacher Influencing Factors on Students' Digital Citizenship Competence

Results of Linear Regression Analysis							
Variable	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**p**	**Collinearity Diagnostics**	
	B	**Std. Error**	**Beta**			**VIF**	**Tolerance**
Constant	1.983	0.332	-	5.965	0.000**	-	-
Teacher's ICT Use	0.029	0.056	0.039	0.526	0.599	1.708	0.586
Teacher's Internet Self-Efficacy	0.422	0.062	0.496	6.846	0.000**	1.601	0.625
Teacher's Internet Anxiety	-0.077	0.054	-0.104	-1.426	0.155	1.619	0.618
R^2	0.338						
Adjusted R^2	0.329						
F	F =34.449,p=0.000						
D-W Value	1.930						
Dependent Variable: Student's Digital Citizenship Literacy							
* p<0.05 ** p<0.01							

As shown in Table 7 above, a linear regression analysis was conducted with teachers' use of information technology, teachers' internet self-efficacy, and teachers' internet anxiety as independent variables, and digital citizenship literacy as the dependent variable. The model formula derived is as follows:

Digital Citizenship Literacy = 1.983 + 0.029 * Teachers' Use of Information Technology + 0.422 * Teachers' Internet Self-Efficacy - 0.077 * Teachers' Internet Anxiety,the model's R-squared value is 0.338, indicating that the three independent variables collectively explain 33.8% of the variation in digital citizenship literacy.An F-test of the model shows that it passes the test (F = 34.449, p = 0.000 < 0.05), meaning that at least one of the independent variables—teachers' use of information technology, teachers' internet self-efficacy, or teachers' internet anxiety—has a significant impact on digital citizenship literacy.

Furthermore, tests for multicollinearity reveal that all Variance Inflation Factor (VIF) values in

the model are below 5, indicating no significant multicollinearity issues. The Durbin-Watson (D-W) statistic is close to 2, suggesting no autocorrelation in the model and confirming that the sample data are independent, which demonstrates the robustness of the model.

The detailed analysis reveals the following:
Teachers' Use of Information Technology: Regression coefficient = 0.029 (t = 0.526, p = 0.599 > 0.05), indicating no significant effect on digital citizenship literacy.
Teachers' Internet Self-Efficacy: Regression coefficient = 0.422 (t = 6.846, p = 0.000 < 0.01), indicating a significant positive effect on digital citizenship literacy.
Teachers' Internet Anxiety: Regression coefficient = -0.077 (t = -1.426, p = 0.155 > 0.05), indicating no significant effect on digital citizenship literacy.
In summary, teachers' internet self-efficacy has a significant positive effect on digital citizenship literacy. However, teachers' use of information technology and teachers' internet anxiety do not show a significant impact on digital citizenship literacy.

Interpretation of Key Findings
Individual Factors: Awakening Intrinsic "Digital Confidence" and "Emotional Connection"
Students' computer self-efficacy (β = 0.214, p < 0.01) and internet attitude (β = 0.201, p < 0.01) both significantly and positively influence the development of their digital citizenship literacy. This finding reveals that:

Cultivating technological competence should not be limited to operational training; it must also focus on nurturing students' internal belief of "I can do it." Only when students believe they can master technology can technology truly become a tool for exploration and creation. A positive internet attitude provides students with emotional motivation, encouraging them to actively transform digital spaces from passive "entertainment venues" into dynamic "platforms for learning, collaboration, and growth."

Environmental Factors: Building a Growth Ecosystem with "Support and Role Models"
Perceived organizational support (β = 0.087, p < 0.01), though modest in coefficient, provides students with indispensable "security" and "direction." Clear policy guidance, sustained resource investment, and a culture that encourages innovation collectively form the institutional foundation for literacy development.

Teachers' internet self-efficacy (β = 0.422, p < 0.01) demonstrates a strong positive influence, highlighting the power of "actions speaking louder than words." A teacher who confidently and calmly uses technology is, in essence, a walking "digital literacy curriculum."
Notably, teachers' frequency of information technology use (β = 0.029, p = 0.599) and internet anxiety (β = -0.077, p = 0.155) did not show significant effects. This reminds us that:
Technology use is a "necessary condition" for educational transformation but not a "sufficient condition." Simply increasing the frequency of use or the variety of tools does not necessarily lead to substantial improvements in students' literacy.

Teachers' anxiety does not directly "transfer" to students, suggesting that students' development depends more on the positive interaction patterns and the depth of technology integration established during the educational process.

Behavioral Factors: Honing "Soft Skills for the Digital Age" in Authentic Contexts
Students' interpersonal communication skills ($\beta = 0.124$, $p < 0.01$), social media proficiency ($\beta = 0.075$, $p < 0.01$), and 21st-century digital skills ($\beta = 0.144$, $p < 0.01$) all contribute significantly and positively to their digital citizenship literacy. This finding is particularly insightful for vocational education:

Teaching models such as project-based learning and teamwork serve as natural environments for cultivating students' communication, collaboration, and digital problem-solving abilities. These skills, honed through real-world tasks, can be seamlessly transferred to the complex interactions of digital environments, creating a virtuous cycle of "learning by doing and understanding through practice."

Conclusions and Practical Implications

Research Conclusions

This study, through quantitative analysis, systematically reveals the multi-level factors influencing the development of students' digital citizenship literacy, and arrives at the following core conclusions:
First, the core driving force for literacy development stems from the synergistic effect of "intrinsic belief" and "emotional identification".

Students' computer self-efficacy and attitudes towards the internet are not merely external indicators of technical skill, but are psychological engines that drive them to actively embrace digital civilization. When technology learning and emotional experience are deeply integrated, digital literacy transcends being a "passive requirement" and evolves into an "active pursuit". Students cease to be mere consumers of technology and become co-creators of the digital ecosystem.

Second, the value of the educational environment lies not in the "piling up of technology", but in the "cultivation of an ecosystem".
Organizational support provides the institutional guarantee for literacy development. However, the truly profound influence comes from the exemplary power of teachers as "digital role models". A teacher's confidence and integrative ability with technology shape students' cognitive and behavioral patterns far more significantly than the mere frequency of use. The key to educational transformation lies in moving from "tool application" to "cultural reconstruction", fostering a new educational ecology where technology empowers humanity and innovation nurtures responsibility.

Third, the transfer of abilities in authentic contexts is the key pathway for literacy to take root. Digital citizenship literacy is not an isolated knowledge module, but a comprehensive competency system intertwined and mutually reinforcing with "soft skills" such as communication, collaboration, and problem-solving. Pedagogical models widely used in vocational education, such as project-based learning and teamwork, provide a natural arena for the practical application of this literacy, achieving the integrated development of "skill training" and "literacy cultivation".

Practical Implications

Based on the above conclusions, this study proposes the following actionable insights for

educational practitioners, policymakers, and school administrators.

Recommendations for Educational Practitioners

Implement a dual-track digital literacy teaching strategy focusing on both "psychology" and "skills".

Belief Awakening Program: Embed "success experience" modules within technology courses. Use scaffolded task design and process-oriented motivational feedback to systematically enhance students' computer self-efficacy. For example, establish "Digital Challenge Badges" to document students' growth trajectories from completing basic operations to creatively solving problems.

Emotional Connection Workshops: Conduct activities to guide positive internet attitudes, such as "Digital Space Narrative Creation" or "Online Ethics Scenario Role-plays." These help students understand the multidimensional value of the internet as a platform for learning and creation, moving beyond a singular perception of it as merely a source of entertainment.

Promote a "Teacher-Student" co-growth digital mentorship system.

Role Model Empowerment Initiative: Provide teachers with training focused on "instructional design integration" rather than merely "tool operation," with the key aim of enhancing their internet self-efficacy. Encourage teachers to host sharing sessions like "My Digital Teaching Story," transforming their technology integration experiences into shareable educational wisdom.

Collaborative Inquiry Projects: Design digital projects involving both teachers and students (e.g., campus data journalism, interdisciplinary virtual exhibitions). This allows teachers to demonstrate technological confidence in authentic applications, while students naturally acquire literacy through observation and participation.

Recommendations for School and Institutional Administrators

Construct a digital literacy development ecosystem characterized by "visible support and tangible culture".

Institutional Safeguards: Develop a clear roadmap for digital literacy development, accompanied by stable resource investment and incentive policies. Establish a "Digital Innovation Support Fund" to encourage teachers to conduct literacy-oriented teaching experiments.

Cultural Atmosphere Cultivation: Create events like a "Digital Citizenship Theme Month," involving multi-stakeholder activities such as case study showcases, student forums, and parent workshops. This integrates literacy education into the daily narrative of school life, fostering a collective consensus around "technology for good and innovation with responsibility."

Establish a vocational education literacy cultivation model based on "contextual embedding and competency integration".

Curriculum Integration Design: Explicitly embed digital citizenship competency indicators into professional courses. For example, add a module on "Social Media Ethics and Brand Communication" in marketing courses, or integrate tasks on "Data Security and Collaborative

Tool Application" in engineering technology courses.
Practical Platform Development: Collaborate with enterprises to develop virtual simulation projects or cross-institutional collaborative challenges. This allows students to hone digital communication, collaboration, and problem-solving skills in near-authentic professional scenarios, forming a closed loop of "literacy → skill → application."

Research Limitations and Future Directions

This study focuses on quantitative relationships between variables and has not yet deeply explored the differentiated pathways of literacy development among student groups with different backgrounds (e.g., urban/rural, major, grade level). Future research could further incorporate qualitative methods to trace the dynamic process of literacy formation and explore the following directions:

Cross-Cultural Comparative Studies: Compare the influencing mechanisms of digital citizenship literacy across different countries or regions to distill education adaptation strategies within cultural contexts.

Longitudinal Tracking Design: Use long-term tracking to reveal critical turning points and sustained influencing factors in literacy development.
Technology-Enabled Assessment Innovation: Develop dynamic literacy assessment tools based on learning analytics technology to achieve process diagnosis and personalized intervention.

Digital citizenship literacy is the fundamental ability for individuals in the information age to participate in society and achieve development. It calls for education to shift from a "technology-oriented" approach to one that focuses on "human development", finding a balance between instrumental rationality and value concern. Only when students have firm digital confidence in their hearts, emotionally identify with the creative value of technology, and practically practice digital ethics such as collaboration and responsibility, can we truly cultivate digital citizens of the digital age who can not only master technology but also illuminate the future.

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