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An Empirical Study on the Digital Literacy Level of College Students in Applied Universities Based on Situational Learning Theory

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Abstract: To explore the influencing factors and improvement paths of digital literacy among college students in application-oriented universities, this paper constructs a digital literacy evaluation framework based on the theory of situational learning and conducts a survey of 7,905 students in application-oriented universities. An exploratory factor analysis using SPSS 30 revealed characteristics such as contextualized stratification and significant disciplinary differences in students' digital literacy. Finally, implications were drawn from aspects such as improving lifelong learning services, creating interactive learning scenarios, establishing precise training mechanisms, and building school-enterprise practice communities.

Keywords: Situated learning theory; Digital talent; Digital literacy; Applied universities; Factor analysis

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1. Introduction

Situated learning theory, an important learning theory co-proposed by Lave J and Wenger E, emphasizes that individual learning is a process of gradually integrating from "legitimate marginal participation" into "community of practice," and stresses that "de-contextualized knowledge is fragile" [1]. As a core reserve force for the future digital economy and social innovation, the cultivation of digital literacy among college students is not only a basic ability requirement for individuals to adapt to the digital age, but also a key link for the country to implement the strategy of building a digital talent power and seize the commanding heights of global digital competition. The Outline of the Plan for Building a Strong Education Nation (2024–2035) explicitly puts forward the strategic deployment of "building a learning society and opening up new development tracks and shaping new development advantages through digitalization of education" [2], elevating the cultivation of digital literacy to the core issue of national education development. From a global perspective, digital literacy has become a consensus goal for talent cultivation in the international community, but there are still differences in the definition of its connotation and the use of the concept among countries and international organizations. The UNESCO

Global Framework on Digital Literacy, released in 2018, covers seven major areas including hardware and software foundations, information and data literacy, communication and collaboration, digital content creation, security protection, problem-solving, and career-related skills, which are detailed into 26 specific indicators [3].

In China, the "Action Plan for Improving Digital Literacy and Skills for All" defines digital literacy as "the collection of qualities and abilities that citizens in the digital society should have for learning, working and living in terms of digital access, production, use, evaluation, interaction, sharing, innovation, security and ethics" [4], providing a macro framework for the cultivation of local digital literacy. In addition, in the "Survey Report on the Development Level of Digital Literacy and Skills of the Entire Population (2024)" released by the Cyberspace Administration of China, the survey content of digital literacy and skills of the entire population mainly includes the status of digital literacy and skills, participation in digital activities and demographic characteristics of respondents, and its core indicators cover digital cognition, digital skills and digital thinking [5]. This also provides a useful reference for the assessment of digital literacy. Based on the Global Framework of Digital Literacy, this paper designs a digital literacy level assessment scale that includes the core elements of situational learning, and analyzes the overall level of digital literacy and related influencing factors of college students in application-oriented universities based on the results of the questionnaire survey, providing data support and decision-making reference for exploring the path to improving the digital literacy of college students in application-oriented universities.

2. Research design

2.1. Sample design

The study used Wenjuanxing to collect data from college students in applied universities in Hubei Province. The survey was conducted in December 2024, and 7,905 valid questionnaires were collected. The questionnaire was designed with 41 items, including 4 items of basic sample information and 36 items of core variables, all of which were multiple-choice questions. For the convenience of subsequent analysis, all the contents of the questions were represented by variable codes. Among the samples, 52.2% were male and 47.8% were female; Freshmen, sophomores, juniors and seniors accounted for 33%, 26%, 26% and 15% respectively; 77.2% of students have participated in digital literacy education activities, and 22.8% have not. Engineering students accounted for 42.7%, art students accounted for 15.3%, and students in the four disciplines of literature, economics, management, and education accounted for 42%.

2.2. Research tools

To facilitate students' self-assessment of their digital literacy level, all core variable questions in the questionnaire were scored using the Likert five-point scale (marked as 5, 4, 3, 2, and 1, respectively) [6], and the higher the score, the higher the level of digital literacy. Using the software tool SPSS 30, an exploratory factor analysis was conducted on the questionnaire [7]. After eliminating items with confusing correspondence between individual questions and factors, 33 core questions were retained and those belonging to the same factor explanation were grouped together.

2.3. Reliability and validity analysis

The study used Cronbach's Alpha coefficient as the criterion for reliability testing. The Cronbach's Alpha values for the reliability of the 33 variables in the scale were all greater than 0.9, and the overall reliability of the 33 items, as measured by Cronbach's Alpha, was 0.989, which exceeds 0.9. It can be seen that the reliability of the study sample is very good. The study used KMO and Bartlett's sphericity tests as validity criteria. The KMO value was 0.986,

greater than 0.7, and the P value corresponding to the Bartlett's sphericity test was less than 0.001. The cumulative variance interpretation rate of the five explored factors was 86.831%, indicating good structural validity. According to the rotating component matrix, the correspondence between the five factors explored (represented by YZ1 for understanding digital technology, YZ2 for accessing digital resources, YZ3 for creating digital content, YZ4 for digital ethics and security, and YZ5 for self-learning using digital tools) and the question was consistent with the expected results. The minimum factor loading coefficient value of the corresponding question is 0.530 and the maximum is 0.777, indicating a good correspondence between the question and the factor and a high level of validity.

3. Research results and analysis

3.1. Analysis of the overall level of digital literacy

In terms of descriptive statistics, the overall average score of digital literacy is 3.907, with a standard deviation of 0.727, and it follows a normal distribution. The scores of the five factors, from low to high, are as follows: Digital technology cognition (YZ1) with an average score of 3.758, digital content creation (YZ3) with an average score of 3.839, access to digital resources (YZ2) with an average score of 3.926, self-directed learning using digital tools (YZ5) with an average score of 3.930, and digital ethics and security (YZ4) with an average score of 4.043. From this, it can be seen that the highest score was in digital ethics and security, which is largely consistent with the research conclusions of Liang et al. [8], Wu et al. [9], indicating that college students in applied universities not only have a high self-assessment in digital ethics and security, but also have clear thinking and judgment, and have a high level of digital security and ethical literacy. In contrast, the self-assessment scores of digital technology cognition and digital content creation were both lower than the total average, indicating that although students in applied universities scored relatively high in self-study using digital tools, their understanding of digital technology was still vague and their ability to create content using digital thinking was relatively weak.

3.2. Analysis of the impact of basic information grouping on digital literacy levels

To investigate whether the basic information grouping of college students in application-oriented universities made significant differences in the overall level of digital literacy, we further conducted independent sample t-tests or single-factor ANOVA tests and found that all five basic information items made significant differences in the overall level of digital literacy. The average score of digital literacy for male college students was 3.980, slightly higher than the average score of 3.826 for female college students, which is consistent [10] with the conclusion of Sun Shaowei's research. Senior students had the highest average digital literacy score at 3.953, while freshmen had the lowest at 3.859. Engineering students had the highest average digital literacy score of 3.989, significantly higher than students in other disciplines. This is closely related to the fact that engineering students in applied universities use digital tools more frequently in classroom activities and subject competitions. Students who participated in digital literacy education activities scored an average of 3.990, while those who did not scored only 3.623. Moreover, college students who participated in digital literacy education activities not only scored significantly higher overall than those who did not, but also scored significantly higher in all five factors than those who did not.

3.3. Correlation analysis of core variables with digital literacy levels

To investigate whether there is a correlation among the variables, we used the Pearson Correlation coefficient for analysis, and the results are shown in **Table 1**. The five factors were respectively significant at the 0.01 level with the average score of digital literacy, and the correlation values were in the range of 0.880 to 0.961, indicating that all

five factors were significantly positively correlated with the average score of digital literacy and had a relatively close correlation with it. Among them, self-directed learning using digital tools (YZ5) has the highest correlation coefficient with average digital literacy at 0.961, and is significantly positively correlated ($p < 0.001$). At the same time, there is also a general positive correlation among the five factors, indicating that there is a close connection among them.

Table 1. Results of correlation analysis

	Digital literacy scores	YZ1	YZ2	YZ3	YZ4	YZ5
Digital literacy score	Pearson correlation	--				
YZ1	Pearson correlation	0.880**	--			
	Significance (two-tailed)	< 0.001				
YZ2	Pearson correlation	0.933**	0.830**	--		
	Significance (two-tailed）	< 0.001	<0.001			
YZ3	Pearson correlation	0.933**	0.824**	0.850**	--	
	Significance (two-tailed)	< 0.001	< 0.001	< 0.001		
YZ4	Pearson correlation	0.892**	0.683**	0.787**	0.782**	--
	Significance (two-tailed)	< 0.001	< 0.001	< 0.001	< 0.001	
YZ5	Pearson correlation	0.961**	0.777**	0.840**	0.871**	0.862**
	Significance (two-tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001

Note: ** indicates a significant correlation at level 0.01 (two-tailed).

3.4. Multiple linear regression analysis between core variables

Assuming YZ5 is the dependent variable and YZ1-YZ4 is the independent variable, the results of the multiple linear regression analysis are shown in **Table 2**. The adjusted R^2 was 0.852, indicating that the four variables YZ1-YZ4 could account for 85.2% of the changes in autonomous learning using digital tools (YZ5), and the model fit was very good. The P values of the four variables YZ1–YZ4 were all less than 0.001, showing significance, and the corresponding regression coefficients B values were 0.074, 0.142, 0.353, and 0.399, all greater than 0. It can be seen that the stronger a college student's sense of identification with digital technology, the more willing they are to use digital platforms in an active way to obtain the necessary resources, the more willing they are to spend time creating digital content, and the better they know how to use digital tools for self-study, which is almost consistent with Joanna Goode's research conclusion [11].

Table 2. Result of multiple linear regression analysis

Model	Unstandardized coefficients		Standardized coefficient	t	P	R^2	Adjusted R^2	Error in standard estimates
	B	Standard error	Beta					
(Constant)	0.128	0.018		6.992	< 0.001	0.853	0.852	0.295
YZ1	0.074	0.008	0.078	9.256	< 0.001			
YZ2	0.142	0.010	0.142	14.556	< 0.001			
YZ3	0.353	0.009	0.363	38.064	< 0.001			
YZ4	0.399	0.007	0.413	55.208	< 0.001			

a. Dependent variable: YZ5 b. Predictor variable: YZ1-YZ4

4. Research implications

4.1. Improve lifelong learning services to cultivate digital talents

College students are the main force for participating in digital work and digital innovation in the future and should have the lifelong learning ability and adaptability necessary for the digital age [12]. In the context of rapid technological iteration, traditional school education can no longer fully meet the demands of social development, and lifelong learning has changed from an individual choice to a necessity for growth. From an international perspective, in April 2025, the European Commission released the AI Continent Action Plan, which identified AI skills and talent as one of the five key areas and launched a series of major initiatives aimed at cultivating digital talent [13], particularly the launch of the one-stop service platform - the AI Skills Academy. In light of China's current situation, ubiquitous and accessible lifelong learning services can be provided through social educational institutions such as university libraries at all levels, public libraries, and cultural centers in various regions. Create always-online classrooms through intelligent learning spaces, provide high-level public services for lifelong learning, and support the realization of a learning society where everyone can learn, everywhere can learn, and anytime can learn.

4.2. Create interactive learning scenarios with digital courses at the core

Courses are the medium for developing digital literacy, and how to integrate digital literacy into courses is the key to cultivating digital talents [14]. The digital literacy and ability development system for students in China has not yet been formed and is rather scattered among different course contents, lacking coherence, progressiveness, relevance, and connection in the design of course contents at different stages [15]. Digital curriculum is a form of curriculum that aims to cultivate innovative talents, embody digital intelligence empowerment thinking, organize and represent teaching content using digital [16], networked and intelligent technologies, conduct scenario-based teaching activities with value guidance, outcome orientation, and problem-solving, and record the teaching process and conduct evidence-based evaluation of the effect. Teachers, relying on high-quality digital course resources on the national Smart education platform, create interactive learning scenarios among teachers and students, among students, and among students, and use AI tools to analyze students' learning situations in real time.

4.3. Use digital evaluation as a means to establish a precise training mechanism

College students in the 21st century have grown up in an environment where digital technology is highly prevalent. They have been exposed to tools and toys of the digital age, such as the Internet, smartphones, and video games, since their childhood, and thus have a natural adaptability and intuitive understanding of the digital environment. The development of students' digital literacy and ability requires the joint efforts of schools, students, and teachers. Schools should incorporate digital literacy into the education evaluation system, establish a "regular monitoring + precise training" working mechanism for students' digital literacy level, and at the same time strengthen the training of teachers' digital technology application and ability, using curriculum reform as a lever, driving the innovation of methods and models, technical support, curriculum systems and forms of digital teaching for college teachers, and comprehensively boost the improvement of digital literacy for college teachers.

4.4. Build a school-enterprise practice community with digital technology as the link

Schools and enterprises jointly offer virtual simulation courses, using virtual devices to simulate real-world physical space equipment to meet the practical training needs of students of different majors, and invite enterprise

technical experts and university teachers to teach digital + professional courses, bringing the real digital scenarios of enterprises into the classroom to build a practice community of "enterprise mentor teaching + real project practice", guiding students to understand digital technology, use digital devices, experience digital services through multimodal experiences such as VR and AR, organize group discussions, lead students to participate in social practices, subject competitions, innovation and entrepreneurship competitions and other activities of enterprises and industry organizations, and enable students to learn by doing and understand by learning, so as to strengthen students' digital thinking and enhance their digital creation ability.

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