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DIGITAL LITERACY COMPETENCY STATUS AND CULTIVATION COUNTERMEASURES FOR COLLEGE STUDENTS IN THE AGE OF DIGITAL INTELLIGENCE

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ABSTRACT

Digital literacy education is developing in depth in the digital age. The overall digital literacy level of the most dynamic and creative college students in the digital age has yet to improve. Based on the survey and research of predecessors, this article discusses in depth the status quo and problems of college students' digital literacy in the digital intelligence era. The paper proposes that the government provides policy and financial support and that giving full play to the leading role is an important guarantee of education. The deepening of digital curriculum reform and the consolidation of the "main front" of college education are the core goals of education, and the goals of education include pluralistic and synergetic participation and consolidating the cornerstone of digital security. Importantly, the embeddedness of the "triple ability" of the teacher's body is strongly strengthened, and the student's main body gives full play to their digital literacy initiative, providing multiple channels for the digital literacy training of college students.

KEYWORDS: digital age; college students; digital literacy ability; training strategy

1. INTRODUCTION

In recent years, with the emergence of artificial intelligence, cloud computing, the Internet of Things, and big data, society has entered the digital age. According to the 52nd "Statistical Report on the internet Development in China" released by the China internet Network Information Center, as of June 2023, the number of internet users in China reached 1.079 billion, an increase of 11.09 million compared with December 2022, and the internet penetration rate reached 1.079 billion. 76.4%. In terms of age structure, internet users aged >20-29 years accounted for 14.2%. In colleges and universities, students use mobile phones, tablets and computers as smart media to extensively and deeply become involved in information cyberspace. As a reserve of high-end talent in the digital field, when faced

with such a variety of rich smart digital products, can we understand and effectively apply these digital products with a dialectical attitude? The digital literacy of college students should be of great importance to society, the government, and colleges and universities. Ge Shi defined digital literacy as the ability and attitude that people use digital means to identify, understand, create, communicate, criticize information and solve problems in work, study, leisure, and social participation [1].

As college students are aboriginals of the internet, the internet has become an indispensable part of their lives, but there are still some problems with their digital literacy. Some studies have shown that [1]there is still room for improvement in students' digital literacy abilities, such as digital information acquisition ability, digital content creation ability, digital security awareness, and comprehensive ability to solve digital problems [2]. Many scholars have analyzed the factors that affect college students' digital literacy from multiple perspectives. Geng Rongna analyzed the factors that cause low digital literacy among college students in five dimensions—subject, object, intermediary, community and division of labor—and rules and used the DEMATEL model to analyze the factors affecting college students' digital literacy. We constructed and calculated the influence of different factors on the digital literacy level of college students. The results showed that university policy, the cultural environment, ICT infrastructure, teaching management, and the evaluation system played the most critical roles [3]. Improving college students' digital literacy is not easy to achieve, and it takes considerable time, manpower, material and financial resources. In the process, they will face a lack of top-level design, unclear training objectives, a chaotic digital environment, backward curriculum reform, and a lack of education. In the digital "golden class", there are many challenges and difficulties, such as the lack of digital teachers, the weak teaching team, the disconnection of teaching, research and application, the dislocation of multidisciplinary cooperation, and the lack of a coeducation mechanism [4]. In the face of challenges and difficulties, we still need to address these difficulties and propose effective measures to cultivate college students' digital literacy at different levels. For example, colleges and universities offer digital literacy courses, professional courses should be organically integrated into digital literacy education [5], and the development of a digital literacy framework should provide guidance. Active measures such as evaluation and practice [6], the guidance and service role of the government in digital literacy education for college students [7], the strengthening of macro coordination, and the scientific determination of college students' digital literacy education [8] should be taken to enhance the ability of college students to acquire digital media literacy, analysis ability, evaluation ability and dissemination ability [9].

In summary, sociologists attach great importance to the cultivation of college students' digital literacy and have conducted many studies on this topic. Most of them focused on the factors affecting college students' digital literacy, the problems encountered in the training of college students' digital literacy, and proposals from the perspectives of the government and the school. As a creator and fresh force of the digital age, studying the current problems in digital literacy is of practical significance, and corresponding countermeasures are proposed to improve digital literacy. This paper starts from the

status quo of college students' digital literacy and proposes some constructive countermeasures from the five perspectives of the government, universities, enterprises, teachers, and students themselves to provide a theoretical basis for colleges and universities to cultivate the digital literacy of college students.

2. The status of digital literacy among college students in China

At present, domestic scholars have focused mainly on the specific abilities of individuals in relation to the connotation of digital literacy. Huang Yan [10] suggested that the connotations of digital literacy should include the ability to acquire digital information, the ability to communicate digitally, the ability to create digital content, the ability to improve digital security and the ability to solve digital problems. In the future, this paper will use these five abilities to explore the digital literacy status of college students in China.

(1) Single digital retrieval method and weak information selection ability

The ability to acquire digital information refers to the ability to use digital devices to search for information through digital retrieval; at the same time, to determine the authenticity, timeliness, accuracy, completeness, comprehensiveness, relevance, immediacy, and accuracy of information; and the information needed. There are various search engines, application software, and retrieval methods. According to Zhang Yan's survey, 68.4% of students mainly rely on engines such as Baidu and Sogou for their studies, and only a small number of students choose People's Daily Online, CCTV, and databases for information research. Retrieved [11]. Similarly, Wang Yuan [12] reported that 18.13% of students on average chose retrieval methods, and 25.91% of students expressed that they did not have confidence in their ability to find and select information. If college students do not have a good grasp of authoritative and systematic information resources and if there is a single method of information acquisition, it will be difficult to develop clear and in-depth linear thinking. This reflects the singularity of college students in terms of their choice of digital retrieval method and lack of information identification ability, and it further reflects their lack of digital literacy.

(2) There is a subjective preference in digital communication, and awareness of cyber norms urgently needs to be strengthened.

Digital communication capability not only refers to the use of digital devices to communicate and share information with others but also includes the ability to participate in social activities and cooperate with others through digital channels while strictly abiding by online norms. As the "indigenous people" of the digital age, college students use digital devices as common communication tools. They can use digital devices for communication, information sharing and participation in social activities. However, some scholars have found that most college students spend more than 2 hours a day on the mobile internet, and 51% of students spend 4 to 6 hours on entertainment [13]. Due to weak self-control, college students are prone to addiction to the internet and lack realistic communication and motivation to learn. Second, college students are still mentally immature and have weak legal awareness. Relevant studies have shown that some college students exhibit unethical online behaviors when they participate in online activities [14]. College students have certain digital communication

abilities, but for their own reasons, they are prone to rely excessively on the network, and their awareness of network norms when performing digital communication is relatively weak.

(3) Lack of independent thinking ability and the need to improve the ability to create digital content
The ability to create digital content requires students to use the knowledge learned from digital devices combined with their own thinking to create new digital content and to output the ability from appropriate media. The development of digital technology has made learning knowledge more fair and convenient. However, because digital devices can be used to search for problems at any time, students often give up their ability to think independently and only use digital devices to browse fragmentary knowledge. The skills to reproduce knowledge are lacking. Similarly, Zhang Yan investigated the use of social media among college students and found that the use of social networking sites by students was mainly focused on browsing and forwarding, and the creativity of information content was relatively low. This reflects the lack of digital content creation ability among college students.

(4) Digital security awareness is weak, and prevention awareness needs to be strengthened
Digital security capability refers to an individual's ability to use digital technology to protect the data of digital devices and their own network information while identifying cyber fraud. News reports show that the majority of online fraud victims are post-1990s or post-00s victims, with the peak age being 19 years and 18-25 years, accounting for 52.4% of the total victims. Half of the students were deceived, which shows that their digital security capabilities are lacking. To reduce students' precautionary psychology, fraudsters obtain students' personal information. Anti-virus software is effective enough to reduce the risk of data leakage on digital devices. Based on the big data of online behavior logs in the user online behavior audit system, Zhao [15] found that only the computers and mobile phones of a very small number of college students have installed antiviral software, which reflects the blindness and indifference of college students' awareness of network security and digital security prevention and their failure to protect personal data and privacy well. In the face of complex and chaotic network environments, the digital security literacy of college students still needs to be improved.

(5) Lack of initiative and weak ability to solve numerical problems
The ability to solve digital problems refers to the use of different digital tools to solve problems in study, life, and work through digital channels. Most students understood only the basic functions of Excel, words, and PPTs to assist in the completion of homework, but few students had a deeper understanding of these software packages. Jingwei Zhang also found that 69.6% of students are familiar with the basic concepts of Word and Excel and can master some basic operations, but 30.4% of students are familiar with more complex functions, such as text and image shuffling, pivot charts, and function editing. cannot be grasped yet [16]. Research shows that college students' ability to use digital tools to solve problems is weak, which also reflects their lack of enthusiasm for learning to better use digital tools to solve problems. College students should actively apply digital tools and technologies in social surveys, simulation training, and theses. In learning activities such as reading and writing, rather than just using digital devices to order takeaway, online shopping, and entertainment, we use digital devices as entertainment devices.

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3. Three Strategies for Cultivating the Digital Literacy of College Students

(1) The government provides policy and financial support and gives full play to its guiding role

The government plays the roles of guide, server and supervisor in the process of college students' digital literacy training. On the one hand, policy guidance is needed to grasp the direction of college students' digital literacy training. To enhance the digital literacy of all people, the Central Cyber Security and Informatization Committee issued the "Action Outline for Improving the Digital Literacy and Skills of the People" in 2021. This paper proposes that, as the most dynamic and potential group in the digital age, the cultivation of digital literacy is critical for the realization of national education. The promotion of digital literacy and the development of a strong country with digital talent play key roles. By promulgating the policy requirements for the digital literacy training of college students, the government puts the digital literacy training of college students at the core position in the construction of digital talent power. The main work and core projects should be clearly defined in the policy, such as increasing the supply of high-quality digital resources. Scientific research institutions, universities, corporate entities, and social organizations should be guided to make full use of their advantages in developing and establishing digital literacy and skills training websites, mobile applications, and public accounts, thus providing diversified digital resources. Access channels: promote the opening and sharing of digital resources. High-level colleges and universities should be encouraged to optimize and strengthen digital literacy and skills education training courses by using various media methods, such as video, virtual reality and live broadcasting, and open the sharing of digital courses to the whole society for free. A working group on digital literacy training should be set up for college students to develop an evaluation system for digital literacy training, paying close attention to the implementation status of the education department and colleges and universities. On the other hand, the government needs to provide financial support for the implementation of digital literacy training. First, government subsidies are provided for scientific research institutions, universities, enterprise entities and other organizations to develop and maintain websites and mobile programs to attract and train technical talent; second, funds are increased to support the expansion of digital resource coverage and encourage the opening and sharing of digital resources; and investment in the construction of digital media hardware facilities is increased, as shown in Figure 1.

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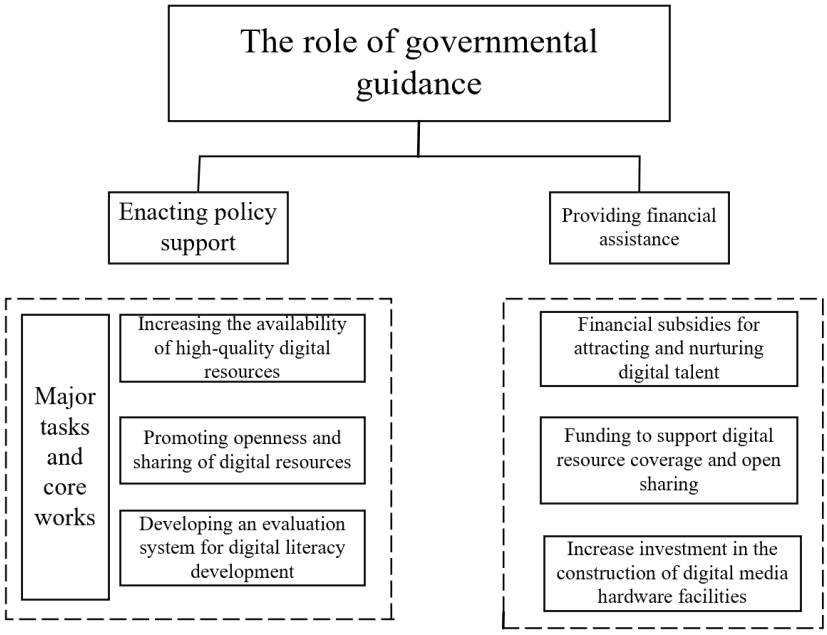

Figure 1 Governmental policy and financial support

(2) Promotion of digital curriculum innovation in depth and consolidation of the "main front" of college education

From the perspective of colleges and universities, as the "main front" for talent training, colleges and universities should assume their own responsibilities and take the initiative to promote digital literacy education to a "compulsory course" for the healthy growth of college students. High-quality digital textbooks are critical for constructing students' knowledge systems and digital education power, as well as for providing the basis for digital curriculum innovation. First, by integrating advanced technical means and high-quality educational resources, digital textbooks provide students with a richer and more personalized learning experience. The compilation of traditional textbooks has the problems of lagging content and not being novel enough in form. Digital textbooks are not limited to paper textbooks but can incorporate additional elements, such as graphics, audio and video, animation and simulation experiments, to make the teaching content more vivid and intuitive. Students' observation, thinking and practical abilities should be better stimulated. Second, general digital literacy education and digital literacy education in professional courses are effectively integrated. In general, digital literacy education involves the popularization of basic digital knowledge to help students meet their most basic digital needs. Digital literacy education in professional courses trains students in specialized fields. Different majors put different emphases on digital literacy training. The effective integration of the two can train students to form creative digital literacy. Colleges and universities develop comprehensive digital literacy courses that organically combine general and professional knowledge. Such courses can provide the basic digital knowledge needed by students and can further strengthen and apply it in the courses of different majors, actively organizing digital practice courses

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to strengthen students' practical ability. The best test of digital literacy education is through practice and project learning. Schools actively organize digital literacy practice projects for students and encourage students to participate in data analysis, internet+, cybersecurity drills and other projects to avoid cramming-style education and to allow students to apply the knowledge learned in actual situations to cultivate and stimulate students' digital literacy, innovative thinking and innovation consciousness; to promote learning through competitions; and to apply what has been learned to continuously strengthen students' practical operation and problem-solving abilities. Finally, digital education should be integrated into career development to develop students' digital preemployment skills. The rapid development of digital technology has largely changed students' career development and occupational needs. According to the individual needs of vocational education in different grades and different majors, digital education with supporting difficulty is embedded to continuously enhance the vocational competitiveness of students. In summary, through the reform of digital textbooks and digital courses, students' abilities to create digital content, solve digital problems, and select digital information are cultivated (Figure 2).

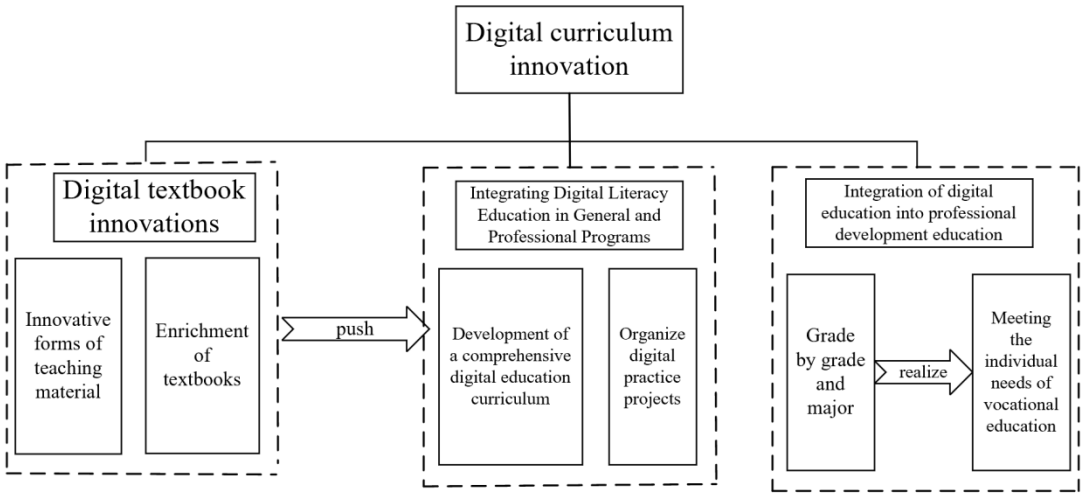

Figure 2: In-depth promotion of digital curriculum reform

(3) Diverse and collaborative participation to lay a solid foundation for students' digital security

Through the diversified and collaborative participation of the government, enterprises, university teaching units, and university libraries, the cornerstone of students' digital security will be solidified. The government needs to strengthen the rule of law on cybersecurity. First, the development of relevant legal systems provides a solid rule of law guaranteeing the digital security of students and society; second, national security organizations strengthen cooperation with other departments to effectively prevent cyber security. To this end, as creators and participants in the digital environment, relevant enterprises can effectively reduce the level of cyber security from the front end and assist the government in carrying out cyber security prevention. With the help of technological innovation, enterprises are increasing their efforts in technology research and development in the fields of data security monitoring and cyber-attack traceability and are conducting in-depth studies on analysis

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technologies for secure transmission, privacy compliance inspection, and data abuse in the big data environment. Digital security education on campuses, which is inseparable from students, is critical. University teaching units first teach students the relevant knowledge of digital security and popularize the functions and operation methods of relevant digital security tools through classroom education. Digital security courses such as cybersecurity, data protection, and cryptography are offered to enable students to understand the basic connotations and principles of digital security and reduce data security issues. Second, colleges and universities provide practice opportunities to students through cooperation with relevant digital security organizations so that students can apply the digital security knowledge learned in actual work and increase their practical experience and problem-solving ability. The modern university library is no longer just a place of "paper accumulation" in the traditional sense; rather, it has become a modern information service center with digital services at its core. The library fills the vacancy of digital safety education in the classroom through extracurricular education to enable the comprehensive development of students. Authoritative experts are invited to give lectures on typical digital security cases and actual data analysis, and a series of digital security-themed activities, such as digital security speech contests, digital security pictorial exhibitions, and digital security knowledge competition, are continuously strengthened for students' digital security knowledge. Finally, online and offline digital safety education should be carried out through channels such as publicity boards, publicity windows, and LED screens on campuses so that digital security education and publicity can cover all aspects of student life (Figure 3).

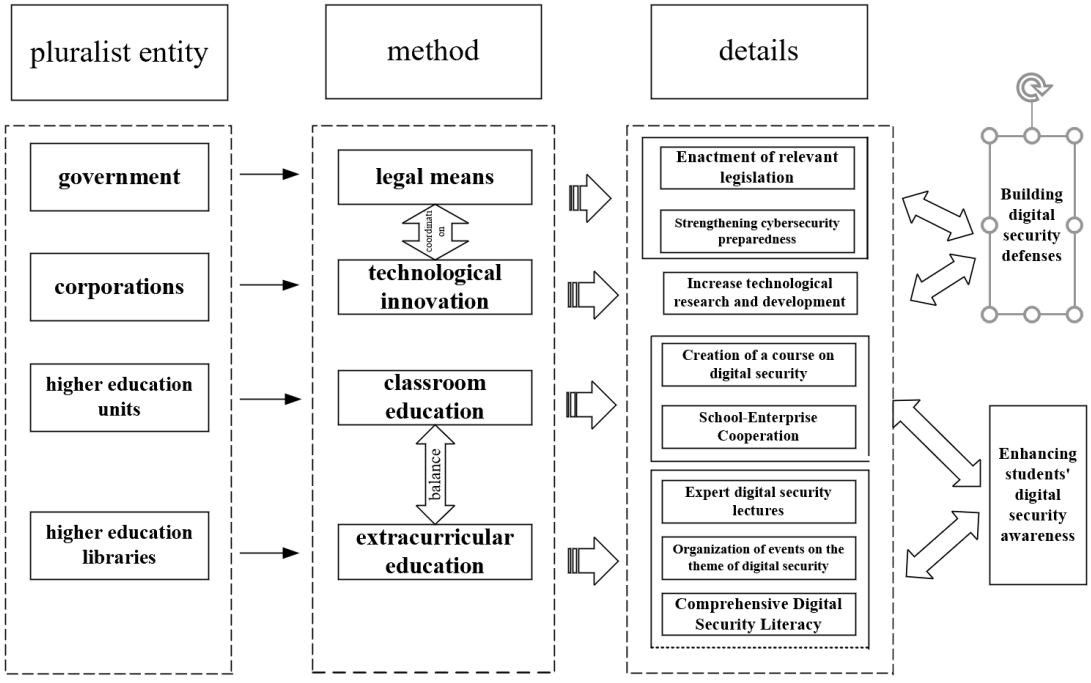

Figure 3: The participation of multiple subjects lays a solid foundation for digital security

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(4) Deeply strengthen the degree to which teachers embed “triple ability”

There is strong interaction between the teacher’s body and the student’s body in the entire teaching design, and the teaching community formed by both parties makes students and teachers equally important and indispensable in the teaching process. An important guarantee for the improvement of college students' digital literacy is the good digital literacy level of college teachers and the construction of high-quality teaching teams. In the digital environment, as the main implementers of the digital literacy development of college students, the overall embedding of the triple ability of “teaching ability”, professional ability, and digital literacy ability” is the key.

In the current digital education environment, teachers are required to enhance their “triple ability” in digital literacy classrooms and to deeply embed their teaching ability, professional ability, and digital literacy ability into the classroom. First, teachers need to improve their teaching ability in two aspects. On the one hand, teachers need to be able to grasp the status quo and characteristics of students’ digital literacy and understand their developmental needs. The picture of digital literacy ability is multilayered. Teachers at different levels in the process are problem-, result-, and goal-oriented and teach students in accordance with their aptitude. On the other hand, by emphasizing the dynamics of the classroom, teachers constantly innovate in digital education through the gradual teaching processes of recording, analysis, reflection, and improvement. A teaching model is used to improve and implement students’ digital literacy. Second, in classroom teaching, teachers fully integrate their professional knowledge and digital literacy ability into the subject-based learning of students’ digital literacy in each professional field rather than adhering to large paragraphs of theory and focusing on digital literacy. In terms of “teaching”, it is recommended that students implement specific functional tasks so that they can master practical operations based on their professional field and innovate classroom education methods. Third, emphasis is placed on the construction of a delivery path to accelerate the improvement of students’ digital literacy and core literacy. Teachers, based on the integration of teaching ability, professional ability, and digital innovation ability, use the combination of “teaching output + innovative teaching methods” to strengthen their teaching power at the teacher’s output end. The receiving power of the student access end is increased, as shown in Figure 4.

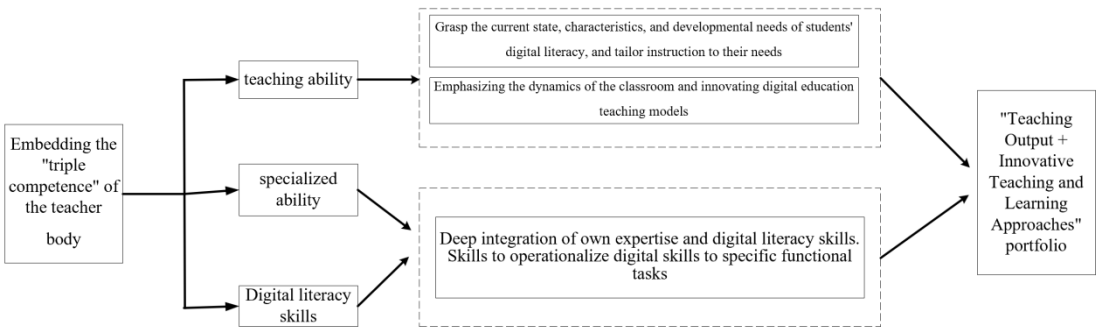

Figure 4: “Triple ability embedding of the teacher’s body”

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(5) Strengthening the initiative of students to fully exploit their digital literacy

In the development process of college students' digital literacy, it is indispensable to pay attention to the diversified and coordinated development of all parties in the development of digital literacy education and the most important students themselves in the process of constructing educational mechanisms. In the context of digital and intelligent development, students are required to clearly recognize their equal status as subjects in the teaching community and to independently exert their subjectivity and initiative. It is difficult to rely on independent and definite methods to improve students' attitudes toward digital literacy learning. Therefore, students are advised to clarify their own goals in the learning process and take into account digital deficits, future occupation-related digital technologies, and future career-related digital resources. For example, by combining multilevel content and integrating attitudinal learning into the content learning of digital literacy, we can refer to the model of "building a learning environment + recording learning outcomes + feedback on learning effects" to consciously increase autonomy (as shown in Figure 5).

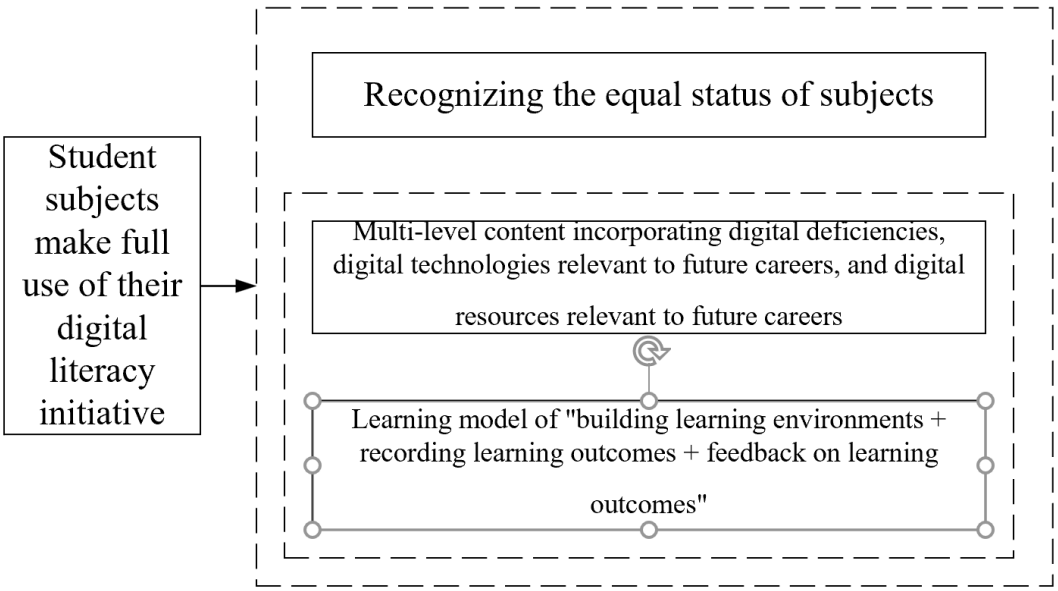

Figure 5: Students give full play to their digital literacy initiative

4. CONCLUSION

Based on the survey and research of scholars, this paper investigated the status quo and problems related to college students' digital literacy. The results revealed that the main problems were single digital retrieval methods, weak information selection ability, subjective preferences in digital communication, the urgent need to strengthen awareness of network norms, and a lack of independent thinking ability. The ability to create digital content needs to be improved, awareness of digital security needs to be weakened, awareness of prevention needs to be strengthened, initiative needs to be taken into account, and the ability to solve digital problems needs to be weakened. As the endogenous driving force for the development of college students in the digital age, the cultivation of digital literacy is

imminent. To this end, this paper proposes training countermeasures from the five perspectives of the government, universities, enterprises, teachers, and students themselves. The purpose of this approach is to invite more scholars to pay attention to and discuss the topic to improve the digital literacy level of college students.

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