

A Study on the Promotion Strategy of Digital Literacy Education from the Perspective of Ecology of Higher Education

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Abstract: Digital literacy education is the basic survival skill of the people in the digital age, which has the characteristics of multidisciplinary intersection. At present, library information literacy education is similar to the digital literacy education advocated by the state. Information literacy education will gradually integrate with digital literacy education, constantly enrich its content and help improve the level of digital literacy of the whole people. From the perspective of higher education ecology, this study takes digital literacy education policy, resources and teacher team construction as the core, analyzes digital literacy education with the help of the systematic view, balanced view and dynamic view of higher education ecological research, studies and analyzes the basic theory and related literature in this field, and puts forward the promotion strategy of digital literacy education. Emphasis on digital literacy ethics education; plan digital literacy education from the top-level design; carry out multi-age digital literacy education activities; enrich the echelon of digital literacy teachers; all-round multi-platform cooperation to share digital literacy education resources and embed digital literacy education into multidisciplinary research.

1. Introduction

The digital economy has changed people's lifestyles. Online shopping, social networking, travel, and self-media are empowering the digital industry. In the new round of digital economic changes, digital literacy has become a necessary skill for people to adapt to the digital economy. In the ecology of higher education, the scientific research of various disciplines is inseparable from the empowerment of digital technology, so digital literacy education has become the theme of the current era. Israeli scholar Alcalay was the first to propose digital literacy. He regarded digital literacy as a necessary survival skill in the digital age, and then proposed a conceptual model of digital literacy as a survival skill, including the ability to use software or operate digital devices, cognitive and social emotional skills in a digital environment, and the ability to perform tasks and solve complex problems in a digital environment [1].

Maslow and Rogers, the representatives of humanistic teaching theory, believe that the fundamental value of education lies in realizing human potential and meeting human needs. In the face of the development of digital technology and the rapid development of digital information society, digital literacy education is of great help in cultivating complete people with sound

personality, harmonious development and freedom. In 2005, UNESCO and IFLA jointly issued the 'Alexandria Declaration', which combines digital literacy with lifelong learning, human development, and the goal of making people better adapt to society. It emphasizes individual self-learning ability and attributes information literacy to library business [2]. The EU Digital Literacy Framework (DigComp2.2) was released in March 2022. In February 2015, the "Higher Education Information Literacy Framework" issued by the Association of College & Research Libraries (ACRL) and the "Action Plan for Improving Digital Literacy and Skills for All" issued by China in 2021 fully illustrate the importance of digital literacy education for social progress and development. At present, in addition to offline information retrieval courses, digital literacy excellent courses are wired on the national higher education wisdom education platform, school online and Chinese university MOOC websites, which provide digital literacy education distance education resources for universities without teachers.

2. Research on Digital Literacy Education from the Perspective of Higher Education Ecology

In 1976, Lawrence Cremi, a professor at Columbia University, formally proposed the concept of ecology of education in the book *Public Education*, studying the relationship between education and the ecological elements of each link related to it, so as to achieve the ecological balance of education. The ecology of higher education is an interdisciplinary subject that uses the connection view, balance view and dynamic view of ecology to study. In 1966, the British scholar Ashby E put forward the concept of ecology of higher education in the comparative study of British, Indian and African universities. It reveals the law of energy flow within the higher education system [3]. In the context of digital education, digital technology is embedded in all aspects of the education system, making knowledge acquisition more convenient, which in turn stimulates the reintegration of various elements from teaching to management. The fundamental standard to measure the balance of higher education ecosystem is to cultivate talents with intellectual accomplishment for the society. Digital literacy education continues the core concept of information literacy in the digital information age, and fully meets the practical needs of modern socialist core values, morality, lifelong learning and digital social life. With the continuous enrichment and development of the connotation of digital literacy, digital literacy education has gradually developed from the initial focus on digital technology application ability to the comprehensive literacy of multidisciplinary cross-integration with digital technology application ability as the core.

In China's higher education, the library of East China Institute of Chemical Technology opened a compulsory course of literature retrieval in 1979, which opened the precedent of digital literacy education in China. From the literature retrieval course in the 1970s to the information literacy course in the twentieth century, and then to the digital literacy course today, it has experienced long-term development and evolution, forming a unique teaching system. With the increasing demand for digital literacy education, digital literacy education has gradually broken through the traditional content of literature retrieval courses. According to the demand for digital literacy education in the digital age, we should re-explore people's learning environment and ecosystem, reconstruct new teaching framework and content, and cultivate people's autonomous learning ability in an all-round and multi-dimensional way, so that people can master retrieval skills and strategies, and then improve their cognitive level.

3. The Symbiotic Relationship of Digital Literacy Education Factors

Exploring digital literacy education from the perspective of system, balance and dynamics.

3.1. Exploring the Environment of Digital Literacy Education from the Perspective of System View

System theory is a theory that Austrian biologist Bertalanffy uses logic and mathematics to examine general systems. It is a collection of elements composed of regular interactions and interdependent forms [4]. In recent years, various education policies issued in China have mentioned the promotion of digital literacy education, which reflects the state's emphasis on digital literacy education from the perspective of education policy environment.

In terms of infrastructure construction, the construction of the national digital education resource public service system has access to 221 platforms at all levels, of which 32 provincial platforms are all connected. Through the system hub environment, high-quality resources are easily pushed to the online learning space. It lays a foundation for the rapid development of digital literacy education from the hardware facilities of digital education. From the overall layout, both the education policy environment and the hardware infrastructure construction are conducive to the rapid development of digital literacy education.

3.2. From the Perspective of Balance, this Paper Explores the Rational Use of Educational Resources by Digital Literacy Education Subjects

The co-construction and sharing of digital resources has promoted educational equity and played a positive role in the overall development balance of digital literacy education and higher education. At present, most colleges and universities have built digital literacy education courses with their own characteristics. In particular, high-quality digital literacy courses can be retrieved on platforms such as 'School Online' and 'China MOOC University' and 'Love Course', which provides strong support for the rapid promotion of digital literacy education. The co-construction and sharing of educational resources alleviates the imbalance in the development of digital literacy education resources in various regions, and is of great help to quickly improve the level of digital education for the whole people.

3.3. Research on Digital Literacy Education from a Dynamic Perspective

Western countries regard improving national digital literacy as a strategic direction for seeking competition. With the accelerated development of the digital economy, people's way of thinking and political, economic, technological, cultural and security patterns have undergone in-depth changes. Digital thinking and the need to actively maintain data security and efficiently solve problems in collaborative learning and work require continuous improvement and upgrading of digital literacy education, and cultivate high-quality talents with lifelong learning and digital adaptability to meet the needs of national strategies and the development of the times are constantly supplemented and innovated to ensure the sustainability and balance of the development of digital literacy education subjects [5].

4. Educational Ecology Elements and Digital Literacy Education

4.1. Educational Resources

Educational resources include human, financial, material, technology, digital resources and teachers' team. It is necessary to reform and innovate in teaching, scientific research, maintenance management and guarantee, so as to optimize the digital literacy education environment and carry out scientific, systematic and comprehensive overall planning and design [6]. In terms of the state

of infrastructure construction, China's digital education infrastructure has been built and covered the whole country, which provides strong support for the realization of distance education and digital literacy education. Especially for remote mountainous areas and areas with scarce educational basic resources, the guarantee of digital equipment enables distance education to help digital literacy education to be fully realized.

4.2. Education Policy

Education policy is the guiding principle of educational practice. 'The value orientation of education policy in each country is a reflection of a certain social culture and institutional form. Education policy is essentially the distribution and control of national and social education resources, which is value-oriented' [7]. In April 2018, the Ministry of Education issued the 'Education Informatization 2.0 Action Plan' and proposed to formulate an evaluation index system for students 'information literacy, carry out large-scale evaluation, and implement targeted training and training. Strengthen the cultivation of students' information technology knowledge, skills, application ability, information consciousness and information ethics, and incorporate students' information literacy into students 'comprehensive quality evaluation. In 2020, the 'China University Informatization Development Report' was officially released. From the educational data released by the state, it can be seen that the state's investment in education informatization is considerable. The letter issued by the Science and Technology Development Center of the Ministry of Education on the release of the "China University Informatization Development Report (2020)" shows that the proportion of informatization funds in China's universities is 4.46%, and the United States is 4.3%. This comparison shows that China's colleges and universities have higher investment in education informatization than the United States.

4.3. Teaching Links

With the deepening of information knowledge and technology in various disciplines, digital literacy education has gradually embedded in the teaching links of various majors, and gradually extended to the network virtual space [8]. Therefore, the form of digital literacy education has gradually changed, from original classroom teaching to remote teaching, flipped classroom teaching, micro-course teaching, MOOC teaching, online and offline hybrid and new media teaching. Non-directive teaching and cooperative teaching theory have a significant impact on the current digital literacy education practice. Scaffolding teaching, situational teaching and interactive teaching in constructivist education are widely used in digital literacy education. In the study of the integrated teaching mode of college students' digital literacy, Professor Ou Qun of South China Agricultural University Library has constructed the integrated teaching mode of college students' digital literacy. Through empirical research, it is verified that college students with different subject backgrounds and ability levels develop digital learning and innovative digital literacy.

4.4. Eco-environment

The ecological environment refers to 'the sum of organisms and all external conditions that affect the survival and development of organisms' [9]. Digital literacy education cultivates people to acquire the latest knowledge through the Internet, which can learn and communicate across regions and time and space, creating conditions for equality between people [10]. This form of education, which is not limited by time and space, promotes educational equity. From the perspective of educational ecology remodeling, digital literacy education is carried out to realize the sharing and co-creation of teaching resources, which creates favorable conditions for the deep cooperation of

digital literacy education in various organizations.

5. Summarization of Digital Literacy Education Research

As of April 10, 2023, 2014 articles have been retrieved from China National Knowledge Infrastructure with the subject word "information literacy education in colleges and universities." It can be seen from the retrieved documents that Wuhan University has published the most research on information literacy in colleges and universities, followed by Shenyang Normal University, Nantong University and Northeast Normal University.

There are 40 projects supported by the National Social Science Foundation, and the rest are education planning projects of provincial education departments. As of April 10, 2023, 1818 articles were retrieved from China National Knowledge Infrastructure with the subject word "digital literacy," and the number of articles published showed an upward trend. Therefore, the research on digital literacy education has been widely concerned by colleges and universities.

Sun Shaowei, a teacher of Sun Yat-sen University, collected 749 online questionnaires in the article "Investigation and Research on College Students' Digital Literacy: Perception Level, Digital Divide and Digital Experience" and concluded that college students themselves think they have certain digital literacy, but there are deficiencies in content and creative ability; college students in different regions, genders and education levels are facing the digital divide; the 'breadth' of digital experience may be more critical to the improvement of individual digital literacy than the 'length' of digital experience [11]. Teachers such as Jin Fan, Department of Information Management of Peking University, in their article "Exploring the Influencing Factors of College Students' Digital Environment Adaptation from the Perspective of Activity Theory," believe that in the process of transition from basic education to higher education, the subject, object, community, tools, rules and division of labor of digital literacy have undergone great changes. The change of digital literacy is influenced by four factors: digital environment, prior ability, cognition and the use of digital technology [12]. Teacher Luo Yijie of Qiannan Normal University for Nationalities analyzed the current situation of K-12 digital literacy education in the United States in the article "Research on K-12 digital literacy education in the United States-Taking the practice of California as an example," and proposed to build a digital literacy sustainable development guarantee system. According to the standard design, a multi-digital literacy education theme resource platform is established; to carry out stratified teaching and train students to learn digital literacy skills step by step; home-school social coordination, jointly create a good quality cultivation space for students [13]. Mr. Hu Xianhui from the library of Henan Institute of Technology studied and analyzed the literature in this field in the "Review of Digital Literacy Education in Chinese Libraries," and proposed to pay attention to the cultivation of digital literacy awareness in libraries and strengthen interdisciplinary and multi-collaborative research. Learn from foreign experience, expand the research content of localized digital literacy education; pay attention to the innovation of digital literacy education evaluation tools and research methods [14]. "New media literacy" of Zhang Zhi'an, a teacher of Sun Yat-sen University, is retrieved from the three platforms of curriculum, school online and mooc of Chinese University. "Artificial Intelligence and Information Society" by Chen Bin, Peking University; shaanxi Normal University Fu Gangshan teacher's 'modern educational technology'; Hao Xingwei's nine excellent video courses, such as "learning computer-computational thinking perspective," have set an example for the digital literacy courses in colleges and universities in China, and also provided a precedent for leading colleges and universities across the country to carry out digital literacy education from different angles.

The rise of network digital resources has given new vitality to distance education. On-demand learning has become the theme of today's digital literacy education. Digital literacy education has

also changed from 'want me to learn' to 'I want to learn'.

At present, although digital literacy education has achieved some gratifying results, the breadth of digital literacy education is still not enough. Whether it is academic research or daily life, digital literacy is an essential ability for people in the digital society. The lack of digital literacy education as a compulsory course for students is the weakness of digital literacy education.

6. Promotion Strategy of Digital Literacy Education

The level of digital literacy education implicitly affects the educational ecosystem. Combined with the above ecological elements of higher education, this paper examines digital literacy education from multiple perspectives and disciplines. From the perspective of digital technology enabling multidisciplinary digital literacy research, from the perspective of system view, balance view and dynamic view of ecological research, this paper puts forward the strategy of improving digital literacy, so as to provide reference for the reform of digital literacy education.

6.1. Pay Attention to Digital Literacy Ethics Education

In the digital age, granary knows etiquette, food and clothing knows honor and disgrace, and moral consciousness is the focus of digital literacy education in colleges and universities in the digital age. At present, digital literacy is involved everywhere in mobile payment, sharing economy, e-commerce and smart travel; short video addiction and Internet addiction have become challenges to the survival of digital society. While rich information resources bring convenience to people, their negative effects are gradually emerging. In sudden public events, information epidemics cause public panic. Therefore, good moral ethics and legal awareness in the digital information society are the cornerstone of the stability of the digital society. In the digital society, it is the most important part of digital literacy education to consciously protect national digital information security, reverse the law, love the motherland, safeguard national dignity, consciously abide by digital ethical norms, strengthen digital information moral consciousness, consciously maintain digital network information security while acquiring information and absorbing knowledge on the Internet, and improve the ability to identify information.

6.2. Support Digital Literacy Education from the Top-level Design

Public cultural institutions such as education departments and libraries at all levels should pay attention to the development of digital literacy education, especially public libraries, community libraries and cultural centers outside the education system, regularly carry out digital literacy education and training, organize national digital literacy education activities, and achieve rapid improvement of digital literacy skills. Actively launch digital literacy education courses on new media social platforms, so that people can receive digital literacy education in leisure entertainment.

6.3. Carry out Multi-age Digital Literacy Education Activities

According to different ages, educational levels and special groups, set up precise docking digital literacy teaching content. To build a lifelong learning education system, especially for young people and the elderly, it is necessary to analyze the disciplinary ecology of the educated, reform the curriculum paradigm and educational strategies, and improve and optimize teaching activities. In the process of digital literacy education, we should cultivate good digital ethical habits and the ability to use digital equipment, focus on the teaching of professional knowledge retrieval and information acquisition ability, expand learning resource retrieval education, and gradually establish

a lifelong learning society of co-construction and sharing.

6.4. Enrich the Echelon of Digital Literacy Teachers

Digital literacy teachers should improve the judgment of the value of digital information and the application of digital information technology. On November 30, 2022, the Ministry of Education issued the "Teacher Digital Literacy" education industry standard, which gives the framework of teacher digital literacy, and stipulates the requirements of five dimensions: digital awareness, digital technology knowledge and skills, digital application, digital social responsibility and professional development requires digital literacy teachers to constantly adjust the teaching content from the perspective of teachers' quality, so as to carry out educational activities efficiently and timely, and form a new dimension of digital literacy education to improve the teaching effect of digital literacy.

With the development of digital technology, digital literacy education requires teachers from different disciplines to join the digital literacy education teacher team and build the backbone of digital literacy teaching. In particular, public libraries and community libraries should set up digital literacy teaching bases step by step and organize digital literacy education activities regularly. Encourage public cultural service institutions at all levels to set up digital literacy education funds, and hire teachers with multidisciplinary backgrounds to join the digital literacy teaching team. Coordinate the energy of teachers with multidisciplinary background to continuously improve the level of digital literacy of the whole people.

6.5. All-round Multi-platform Cooperation to Share Digital Literacy Education Resources

Open online digital literacy curriculum resources in colleges and universities, build digital literacy education micro-classroom, give full play to the advantages of distance education, teach a thematic knowledge in three or five minutes, and carry out thematic digital literacy education step by step. According to the needs of different audience groups, we provide corresponding educational services, use new media and network platforms and artificial intelligence technology to carry out digital literacy education in a multi-dimensional and all-round way, open digital literacy courses outside the higher education system, realize modern distance education with human and machine collaboration, time and space integration, and constantly improve the co-construction and sharing of digital literacy education resources.

6.6. Embed Digital Literacy Education into Multidisciplinary Research

Digital literacy education is embedded in multidisciplinary research projects, giving full play to the advantages of situational teaching, improving the depth and breadth of academic research, fully reflecting the advantages of digital literacy education in enabling multidisciplinary research, and improving the overall academic level of the educated.

Peng Qingqing, a teacher from School of Economics, Chongqing Technology and Business University, and Li Yulan, a teacher from Chongqing University Library, in their article "Research on Information Literacy Education Embedded in Innovative Practice Teaching Activities of Specialized Courses," show that embedding information literacy education in the teaching of econometrics courses not only improves college students' professional knowledge and information ability, but also has a positive role in promoting the cultivation of college students' innovative consciousness and scientific research spirit [14].

Digital literacy education is of great significance to the scientific research of various disciplines. Exhausting the world's top academic research information requires a higher level of digital literacy. Only by studying as many pre-literature samples as possible can we stand on the shoulders of giants

and constantly innovate and produce new academic value.

7. Conclusion

In the context of various disciplines empowered by digital technology, life learning and academic research at all ages are inseparable from digital technology. Building a lifelong learning society requires the joint efforts of higher education institutions and the whole society.

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