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Research on the Optimization of Information Literacy Education Path for College Students in the Digital Transformation Era

Lili Wang[1], Xianghui Jiang[2]

[1]Guangxi Normal University, Guilin, Guangxi, China
[2]Guilin University of Electronic Technology, Guilin, Guangxi, China

Abstract: ***Digital transformation and development have put forward new requirements and opportunities for information literacy education for college students. This article sorts out the typical characteristics of information literacy education in colleges and universities, and deeply analyzes the current situation and problems in four aspects of information literacy education for college students: curriculum development, teaching staff, teaching resources, and teaching platforms. Finally, it proposes that colleges and universities should improve the hybrid online and offline course development system, give full play to the subjectivity of the teaching staff, accelerate the construction of a mechanism for the co-construction and sharing of teaching resources, and build a diversified information literacy education platform to further optimize the reform and innovation path of information literacy education for college students.***

Keywords: Digital transformation era, Information literacy education, College students**.**

1. Introduction

Driven by the rapid development of modern information technology, the advent of the era of digital transformation has transformed people's lives. Information of all kinds is ubiquitous, filling our senses. Everyone can become a recipient, producer, and disseminator of information. The amount of knowledge and information presented is becoming increasingly massive, explosive, and fragmented. False and vulgar information is also rampant. These issues pose challenges for college students in terms of accessing, discerning, and correctly applying information, as well as maintaining ethical standards for information. The government has also emphasized the need to strengthen information literacy education for college students in the era of digital transformation. Therefore, reforming information literacy education for college students in this era of digital transformation and leveraging the power of digital transformation to cultivate students' information literacy skills is an area of urgent need for reform in information literacy education for college students.

2. Typical Characteristics of Information Literacy Education for College Students in the Era of Digital Transformation

2.1 Digital Intelligence

Digitalization is one of the important characteristics of information literacy education in the era of digital transformation. The development of the digital transformation era is a concrete manifestation of the current high level of digitalization. Digitalization mainly refers to the new generation of technical thinking, technical products and applications such as big data, artificial intelligence, cloud computing, mobile Internet, and blockchain [1]. Digitalization is the driving force for promoting the reform and innovation of information literacy education in colleges and universities. Information literacy education in colleges and universities must change its concept and actively move closer to new technologies. With the help of digitalization technology, the curriculum, teachers, resources, platforms, etc. of information literacy education can be rebuilt throughout the process; the innovative and high-quality development of digitalization information literacy education in various colleges and universities and the comprehensive collaboration and open sharing between schools can be achieved, and the co-construction and sharing of high-quality resources inside and outside the school can be realized, which will help information literacy education gradually extend to pan-information literacy education and promote the reform and expansion of information literacy education in colleges and universities.

2.2 Embedded

Modern information literacy education has obvious embedded characteristics in terms of teaching staff, course content, and classroom teaching activities [2]. The information literacy teaching team is different from the singleness of the traditional subject teaching team. It is an interactive and collaborative mixed group with library information literacy teachers as the main body and teachers from various disciplines as the auxiliary. The cultivation of information literacy of teachers from various disciplines is embedded in the construction of the information literacy teaching team [3]. In terms of course content setting, in addition to basic information skills, information literacy content can also be embedded in the content of each discipline in a customized manner to meet the requirements of different disciplines for information literacy and improve the precision of subject information literacy education [4]. Colleges and universities can also learn from past practical experience and embed online courses based on user portraits into the subject knowledge service system. Teachers can also design various forms of information literacy education knowledge according to student needs and embed them into daily classroom teaching activities in a fragmented manner.

2.3 Immersive

The immersive characteristics of information literacy education are mainly reflected in the teaching classroom of teachers and the learning environment of students [5]. For example, subject teachers use digital transformation technology to integrate information literacy knowledge into the subject knowledge system and create virtual subject information literacy classrooms, where students can conduct immersive experiential learning in the context and scenes of specific subjects [6]. The virtual education environment built by teachers with the help of digital transformation technology can truly reproduce educational scenes that cannot be realized in reality, create various types of immersive information literacy education virtual learning environments, and immerse college students in different virtual scenes. This immersive learning in a virtual environment can well make up for the educational deficiencies that cannot be realized in real education scenes. College students can improve their information literacy abilities through immersive learning through personal participation and experience in virtual scenes.

3. The Current Situation and Problems of Information Literacy Education in Colleges and Universities in the Era of Digital Transformation

3.1 Curriculum Construction has Not Yet Formed a Sound System

At present, the information literacy education courses for college students in various universities are mainly based on basic information skills courses such as document retrieval. Through exchanges with teachers in some university libraries and literature research, it is found that the importance attached to information literacy education by various universities varies. The lack of attention in top-level design has led to the incompleteness of the system and dimensions of course construction. From the perspective of the importance attached to top-level design, most universities have opened several information literacy courses [7], and a small number of universities have canceled or never opened similar courses, and only supplemented them with elective courses or special lectures [8]. From the perspective of the supply of teachers, due to reasons such as funding and teachers, the dimensions of course offerings are still too single. Most universities still only offer basic information retrieval skills courses, and have not developed courses such as information awareness, information ethics, and information morality in line with the development of the digital transformation era [9]. Of course, there are also a small number of high-quality universities that have opened similar information literacy courses. In addition, the development of information literacy courses for different disciplines and grades in most universities is still insufficient. From the perspective of the degree of resource matching, the construction of gold courses and online courses for information literacy courses is not given enough attention. Except for some high-quality universities that have started to develop online courses, the vast majority of universities still focus on offline courses and have not started or are just preparing to start developing online courses.

3.2 Faculty Team Building Fails to Provide Intellectual Support

The information literacy education teaching team in colleges and universities has failed to provide favorable intellectual support for information literacy education in a timely manner due to reasons such as a single professional background knowledge structure, lack of professional research, and less professional training [10]. From the perspective of professional background and knowledge structure, according to research, the information literacy teachers in various colleges and universities are mainly library staff, supplemented by subject teachers in various secondary colleges ; the vast majority of library information literacy teachers have a professional background in library and information science, but the subject teachers in various colleges and universities have almost no professional background and knowledge structure in information literacy [11]. This has led to the professional construction, core knowledge, and professional foundation of the information literacy education teaching team being weak, which has affected the development of the information literacy education discipline. From the perspective of professional research, research on teaching reform of information literacy education in colleges and universities is relatively rare. Schools and teachers do not pay much attention to the teaching reform of information literacy education. Without cutting-edge teaching reform research results, it is impossible to promote the reform of information literacy education and improve the teaching quality. From the perspective of professional training, information literacy teachers have relatively few opportunities for professional training and further studies [12]. Some universities offer relevant training for librarians, but there are relatively few activities specifically for teacher information literacy education training. Information literacy teachers lack opportunities and channels to improve their professional qualities and professional abilities. The professional qualities and abilities of information literacy teachers cannot be improved in a timely manner, which will inevitably affect the development of the discipline and teaching quality of information literacy education in universities [13].

3.3 Teaching Resources have Not Been Fully Integrated

In the era of digital transformation, the teaching resources for information literacy education in colleges and universities mainly include library resources and teaching electronic resources. From the construction of multimedia resources such as library basic resources, teaching videos, and micro-courses, it can be seen that various teaching resources have not been fully integrated [14]. From the perspective of library basic resources, most colleges and universities have not fully utilized the new technologies in the era of digital transformation to realize the co-construction and sharing of high-quality resources inside and outside the school, and only serve the teachers and students of the school. From the perspective of the construction and use of teaching videos, some colleges and universities choose to introduce teaching resources from social institutions, such as high-quality course videos from MOOC platforms such as China University MOOC, Xuetang Online, Dingnixuetang, and Haodaxue Online [15], and some colleges and universities choose to build their own teaching videos. However, from the perspective of the independent operation of major platforms and colleges and universities, the teaching resources for

information literacy education in colleges and universities have not been fully integrated, and the resources are relatively scattered. Colleges and universities have not made enough efforts to integrate social resources and self-built resources, resulting in the waste of some resources. In terms of micro-course construction, according to literature research, it is found that most high-quality universities use modern information technology to produce online teaching resources, such as providing students with information literacy education micro-videos or micro-courses through library websites or WeChat public accounts [14]. However, many universities have not provided similar teaching resources in a timely manner [16]. Therefore, in the era of educational informatization 2.0, the efforts of various universities to integrate the teaching process with modern information technology, reform teaching methods and integrate teaching resources are still insufficient, and there is still a lot of room for development.

3.4 The Quality of Education and Teaching Platforms is Weak

The quality of the construction of information literacy education and teaching platforms in various universities also affects the effectiveness of information literacy education [17]. At present, there are few independent teaching platforms for information literacy education in universities. Most of them are based on library websites and are embedded in information literacy education modules [18]. However, some university libraries do not embed or set up information literacy education modules, and instead use similar modules such as freshman admission education. Some universities have also built information literacy education and teaching platforms, but they are basically developed by social organizations. Most of the functional modules are similar, the resources are monotonous, and they lack characteristics. Due to different training objects, mismatched majors, and different teaching concepts, universities cannot use the information literacy teaching platforms designed uniformly by social organizations to meet the personalized needs of students with different disciplines in different universities. For example, the information literacy education and teaching platforms of medical colleges and the information literacy education and teaching platforms of teacher training colleges [19] have completely different needs because they face different student groups. If they all use the teaching platforms designed uniformly by social organizations, it will be impossible to carry out information literacy education for different student groups in a targeted manner. Of course, some universities have built independent teaching platforms with their own school characteristics, but their functions are relatively simple, focusing only on simple information literacy courses and entrance education, without integrating demand research, evaluation, assessment, retrieval, etc.; or due to untimely maintenance and content that does not attract students, the click rate of the self-created teaching platform is not high, and the enthusiasm of universities for subsequent construction has gradually weakened.

4. Path Optimization of Information Literacy Education for College Students in the Era of Digital Transformation

The 2019 IFLA Presidential Meeting released the "2019 Development and Information Access Report." The report's standards and requirements for information literacy education offer new concepts, approaches, and methods for innovative reforms in information literacy education in universities in China's digital transformation era. The "Specifications for the Construction of Digital Campuses in Higher Education Institutions (Trial Implementation)" issued by the Ministry of Education in 2021 comprehensively explains the components and cultivation methods of information literacy. Therefore, universities should develop a four-pronged approach to optimizing information literacy curriculum development, faculty training, resource sharing, and platform development to jointly promote the development of information literacy education in the era of digital transformation.

4.1 Improve the Online and Offline Hybrid Course Development System

First of all, colleges and universities should improve the development system of information literacy education courses that are mixed online and offline. With the development of the new generation of information technology in the era of digital transformation, new opportunities and challenges have been brought to information literacy education in colleges and universities. Colleges and universities should seize the development opportunities, take the library as the main body of course construction, and in addition to building high-quality offline courses, they should also create online courses for information literacy education, build online boutique courses in the form of MOOCs, micro-courses, etc., and build first-class courses that are mixed online and offline to ensure the high-level, innovative and challenging nature of information literacy courses, and create gold courses for information literacy education to meet the needs of innovative, compound and application-oriented talent training. [20]; and make information literacy education courses run through the entire process of teaching and research for normal students, so that the content of information literacy education is not only adapted to the needs of normal students, but also seamlessly connected to the talent training system of colleges and universities.

The macro level of curriculum setting, colleges and universities offer compulsory general courses on information awareness, information knowledge, information application ability, information ethics and security for all students to cultivate students' basic information literacy skills and knowledge; at the meso level, they design interdisciplinary embedded courses that integrate information literacy courses with teaching and scientific research to cultivate students' practical application ability of information literacy; at the micro level, they design personalized courses or lectures for different targets, such as designing special lectures or seminars for freshmen and students with different needs.

4.2 Give Full Play to the Subjectivity of the Teaching Staff

In the era of digital transformation, colleges and universities should give full play to the subjectivity of information literacy teachers. First, they should improve the professional level of information literacy teachers and provide favorable intellectual support for information literacy education. The

information literacy level of teachers determines the effectiveness of information literacy education. Therefore, colleges and universities should formulate professional quality training plans to improve the professional level of information literacy teachers, and carry out differentiated and benchmarked online and offline training or exchange learning for different types of teachers [21]. For example, they should carry out macro-level and professional training for library information literacy teachers to ensure that they have a good grasp of general information literacy course content, information literacy ethics and other macro aspects; and carry out information literacy education training combined with subject knowledge for subject information literacy teachers. Colleges and universities should set up special teaching reform projects for information literacy education, encourage relevant teachers to actively apply for and conduct special research on information literacy education and teaching reform; regularly display excellent teaching results of information literacy education, etc., provide various information literacy education research platforms, provide convenient opportunities for teachers' professional research, improve the theoretical research ability of information literacy teachers, and ensure that advanced knowledge concepts can be better and faster applied in classroom teaching to serve the majority of students.

Secondly, colleges and universities should use digital intelligence technology to seek multi-party forces to enrich the information literacy teaching team and build a strong teaching team that combines on-campus and off-campus, and is interconnected online and offline [22]. Colleges and universities should take the information literacy teachers of the library as the main body, and work together with various departments on campus, such as the network center, information technology, library and information professional teachers and excellent subject teachers from various colleges to build a multidisciplinary cross-border offline classroom of information literacy + disciplines on campus [23]. Secondly, in the era of digital transformation, schools should also take the initiative to actively introduce a group of excellent part-time teachers into college classrooms, such as inviting radio and television media personnel at different levels. They are at the forefront of digital information. Inviting them to enter the classroom will increase students' social adaptability and practicality in the era of digital transformation. For example, invite senior information literacy education experts from other universities to participate in the construction of their own university teaching team in the form of online lectures or seminars.

4.3 Accelerate the Establishment of a Mechanism for the Co-construction and Sharing of Teaching Resources

Colleges and universities should implement the theory of collaborative innovation, reach cooperation agreements with stakeholders in information literacy education inside and outside the school, effectively aggregate high-quality information literacy education resources, accelerate the construction of information literacy teaching resources inside and outside the school, and jointly promote the cooperative environment of information literacy education in colleges and universities [24]. On campus, the library plays a leading role, improves the unification of teaching resources on campus, eliminates disciplinary barriers and college barriers, and uses digital transformation as a medium. The departments and colleges responsible for information literacy education should give full play to their own advantages and jointly build a unified information literacy education and teaching resource on campus [25]. Or with the strong support of the state for modern industry colleges, colleges and universities can establish modern industry colleges of information literacy education that combine industry, academia and research with libraries, social institutions, off-campus data centers and other institutions to integrate high-quality resources; improve the collaborative mechanism for talent training, and enable students to develop into high-quality, application-oriented, compound and innovative talents. This is also the core goal of pan-information literacy education in the era of digital transformation.

Outside the school, colleges and universities should actively introduce information literacy education and teaching resources built by other domestic colleges and universities or institutions [26]. For example, they should use the excellent teachers and teaching classrooms of various big data centers that have been built in China to conduct online live teaching; flexibly introduce high-quality teaching videos, case libraries, information literacy education software, etc. from other colleges and universities. They can also learn from foreign information literacy education alliances and forums to establish domestic or provincial college alliances. Based on their own regional characteristics and information literacy education advantages, they can carry out theoretical research and practical education on information literacy education. For example, the Information Literacy Education Alliance of Shanghai Jiaotong University has achieved a good sharing of teaching resources and has become a high-quality resource that other domestic colleges and universities have learned from. The co-construction and sharing of teaching resources inside and outside the school will provide a favorable resource guarantee for the development of information literacy education.

4.4 Build a Diversified Information Literacy Education Platform

In the era of digital transformation, when universities build information literacy education platforms, they must first consider the user experience and personalized needs. They must use digital transformation technologies and internal and external forces to build multi-type and multi-mode platforms [27], integrate high-quality resources, and enable users to conduct one-stop search and learning [28], ultimately promoting the innovative development of information literacy education. One type is a separate information literacy education high-quality resource platform, such as the library, network information center, and computer school building an on-campus information literacy education network platform, and jointly build a number of common information literacy education and teaching videos for all students to use [29]. The library collaborates with various colleges and universities to utilize digital transformation and new technologies to build information literacy teaching videos, teaching case libraries, MOOCs, micro-courses, digital teaching materials, etc. with their own discipline characteristics [30], and upload them to the information literacy education network platform. Colleges

and universities can also use existing resource platforms to improve students' information literacy education practice ability. For example, in the current college student information literacy challenge, all colleges and universities should give full play to the role of the competition and mobilize all students to actively participate in the competition, using it as a powerful platform to improve the information literacy practice ability of their students.

One is an integrated and comprehensive information literacy education quality testing platform. For example, university libraries can collaborate with computer schools, network centers and other units, or invite off-campus institutions to develop an integrated information literacy education learning quality testing platform [31]. The platform sets up assessment scales for different periods. In the early stage, teachers can investigate students' information literacy education needs, set course content according to the needs, and provide learning content and teaching resources; in the middle stage, teachers conduct process assessments of information literacy education and save process evaluation materials on the platform. At the end of the term, teachers conduct final course assessments of practical operations, etc. Relying on the integrated information literacy education platform, the course evaluation of information literacy education has changed from terminal evaluation to process evaluation. The construction of the original information literacy education platform makes information literacy education more targeted and professional, and the information literacy training of students is more accurate, which improves its teaching quality.

5. Conclusion

According to the National Higher Education Development Plan, the implementation of China's Education Modernization 2035 and the development of Education Informatization 2.0 both require the support of information literacy education. Therefore, information literacy education is a key component of China's information development environment and holds great potential. For university talent development, information literacy education is an essential component in cultivating high-quality, innovative, and multi-faceted talents. With the development of the digital transformation era, information literacy education, empowered by new technologies, has a higher level of innovation and reform, which has broadened the prospects for the development of information literacy education in universities. From an individual perspective, in the era of digital transformation, information is complex and diverse. Information literacy is a fundamental skill that every member of society should possess and a necessary skill for students and researchers. In the ubiquitous knowledge environment, those who lack information literacy face the embarrassing situation of being forgotten or eliminated by information. This study explores information literacy education based on these experiences and provides a reference for the higher education and library and information science communities, aiming to promote collaboration between higher education and libraries and deepen information literacy education for university students.

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Author Profile

Lili Wang (1982-), female, PhD, associate professor, Guangxi Higher Education Teacher Training Center, Guangxi Normal University;

Xianghui Jiang male, PhD, lecturer, Human Resources Department, Guilin University of Electronic Science and Technology.