From Information Literacy Education to Pan-Information Literacy Education: 15 Years of Practical Exploration at the University of Chinese Academy of Sciences (Postprint)

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Abstract

[Purpose/Significance] The transformation of the information environment and the evolution of research paradigms present new opportunities for information literacy education. Therefore, it is necessary to re-examine the limitations of traditional information literacy education, promote the extension and expansion from traditional information literacy education to pan-information literacy education, and accelerate the transformation of information literacy education models in domestic libraries. [Method/Process] By analyzing the concepts and connotations of information and information literacy and their evolutionary processes, comparing the two systems of information literacy education and pan-information literacy education, and taking the pan-information literacy education at the University of Chinese Academy of Sciences as a case study, this paper dissects the structural changes currently taking place in information literacy education. [Results/Conclusion] The key to transforming from information literacy education to pan-information literacy education lies in: clarifying educational purposes, advancing educational objectives, shifting educational perspectives, and demonstrating educational effectiveness. The implementation strategies for transitioning from information literacy education to pan-information literacy education include: cultivating users from general to advanced capabilities, transcending disciplinary boundaries of information literacy education, achieving reforms in the content and system of information literacy education, emphasizing the application of educational technology and methods, constructing applicable scenarios for pan-information literacy education, and strengthening the spatial configuration of pan-information literacy education.

Full Text

From Information Literacy Education to Beyond Information Literacy Education: 15 Years of Practical Exploration at the University of Chinese Academy of Sciences

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Abstract:
[**Purpose/Significance**] The transformation of the information environment and evolution of research paradigms present new opportunities for information literacy education. This necessitates a fundamental reexamination of the limitations of traditional information literacy education, promoting its extension and expansion toward beyond information literacy education, and accelerating the reform of domestic library information literacy education models. [**Method/Process**] By analyzing the concepts, connotations, and evolutionary processes of information and information literacy, this paper conducts a comparative analysis of the two systems of information literacy education and beyond information literacy education. Using the practice of beyond information literacy education at the University of Chinese Academy of Sciences as a case study, it outlines the structural changes currently taking place in information literacy education. [**Result/Conclusion**] The key to transforming from information literacy education to beyond information literacy education lies in four aspects: clarifying educational purpose, advancing educational goals, shifting educational perspective, and demonstrating educational effectiveness. The implementation strategies for this transformation include: cultivating users from general to advanced abilities, crossing the disciplinary boundaries of information literacy education, realizing reforms in content and system, emphasizing the application of educational technologies and methods, constructing appropriate contexts for beyond information literacy education, and strengthening spatial configuration.

Keywords: Information literacy; Information literacy education; Beyond information literacy education; User education; Library services
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Information literacy education has long been regarded as the core content of library user education and a vital component of library service systems. Reform and innovation have consistently accompanied the development of information literacy education. As information environments and user needs continue to evolve, library services must continuously innovate, and information literacy education must continually transform. The International Federation of Library

Associations and Institutions (IFLA) stated in its latest "Global Vision" report [1]: "We must renew our traditional roles in the digital age: the ability to access and utilize information resources, as well as the ability to select, acquire, identify, process, handle, transmit, and create information." Correspondingly, information literacy education trains users in their ability to search for, acquire, evaluate, and utilize information [2].

Over the years, information literacy education has continuously transformed and deepened alongside developments in the concepts and connotations of information and information literacy. Under new information technologies, environments, and capabilities, information literacy should not remain merely at the level of helping people find information. Instead, it should expand its scope to cultivate users' abilities to judge, appropriately manage, and utilize information [3]. The Association of College and Research Libraries (ACRL) in the United States defined information literacy in its 2000 "Information Literacy Competency Standards for Higher Education" [4] as "the ability to know when information is needed and to locate, evaluate, and use it effectively," which became an early consensus. Influenced by this understanding, information literacy education has long been confined within a singular "information" framework, isolating "information" as a standalone concept with information collection, retrieval, and searching at its core.

A noteworthy milestone transformation occurred when ACRL released the "Framework for Information Literacy for Higher Education" [5] in 2016, which redefined information literacy by breaking through traditional information boundaries, extending and expanding its scope, and endowing it with new connotations. The Framework contains four core ideas: (1) information literacy can only achieve its potential through a richer, more complex set of core concepts; (2) librarians bear greater responsibility to identify core concepts within their knowledge domain, expand student learning, establish new cohesive information literacy curricula, and collaborate more extensively with faculty; (3) it integrates many other concepts and ideas related to information, research, and scholarship, emphasizing the integration of information literacy with the research and academic process; and (4) it introduces the concept of metaliteracy—a literacy that generates other literacies—which has become a new guiding orientation for information literacy transformation [6].

In China, user education centered on "literature retrieval" has undergone continuous reform and development since the Ministry of Education issued its "Opinions on Offering Literature Retrieval and Utilization Courses in Higher Education Institutions" in 1984. In terms of educational audience, it has expanded from information literacy education for undergraduate and graduate students to that for primary and secondary school students [7], teachers [8], and citizens [9]. In terms of teaching content and curriculum systems, it has evolved from library literacy [10] to information literacy, media literacy [11], digital literacy [12], data literacy [13], and information ethics [14]. In terms of educational methods and approaches, it has progressed from online literature retrieval to

MOOCs [15], flipped classrooms [16], embedded librarianship [17], collaborative models [18], and gamification [19].

The cognition reflected in the Framework and increasingly recognized in academia and practice is that information literacy education cannot be limited to a narrow "information" category. Instead, it must integrate into the research process and academic environment rather than isolating itself, thereby expanding the scope of information literacy education. Regardless of how we interpret information, its crucial characteristic is its dependence on context. Information does not exist in isolation; it is always closely associated with specific environments, tasks, and needs. In this sense, the reason traditional information literacy education has not achieved its intended effectiveness lies in its isolated understanding of information, information literacy, and information literacy education, failing to situate them within specific contexts, thereby limiting the efficacy of information literacy education. The cognition in the Framework and related research provides a theoretical foundation for extending and expanding information literacy education into beyond information literacy education.

Beyond information literacy education is a new concept we propose, referring to a new information literacy education system that builds upon information literacy education but integrates into specific contexts to cultivate research and innovation literacy capabilities that transcend traditional information literacy. Beyond information literacy education represents the inevitable outcome of information literacy education development in the new era—a transformation of its connotation and structure. It constitutes a set of combined abilities including information literacy capability, representing both the transformation and sublimation of information literacy capability and the extension and expansion of information literacy education. Beyond information literacy education emphasizes breaking through the limitations of single literature retrieval training, transcending the confines of established information conceptual frameworks, and moving beyond merely cultivating users' abilities to find, evaluate, and utilize information. Instead, it organically integrates information literacy capabilities with research and innovation capabilities, promoting the alignment of information literacy with specific needs, tasks, and scenarios (referred to as "contexts"), thereby providing users with context-based, research-oriented, and innovation-focused information literacy education. This enhances the relevance, effectiveness, and comprehensiveness of information literacy education, integrating it throughout the process of research and innovation literacy and embedding information literacy capabilities into core disciplinary competencies where they can play a significant role—this constitutes the fundamental significance and value of beyond information literacy education.

1. The Evolution from Information Literacy Education to Beyond Information Literacy Education

1.1 Conceptual Definition and Research Status

Information literacy (also called "information quality") refers to people's ability to utilize information tools. The core of the traditional information literacy education system encompasses library literacy and literature retrieval, primarily delivered by librarians for the purpose of library resource utilization. This includes explaining library resource overviews, purchased database usage, professional literature searching, and information analysis software operation, providing services such as library orientation, literature retrieval, reading literacy, scientific and technological novelty search, and user education. Libraries, resources, networks, and digitization constitute the important supporting elements of this system.

In contrast, the core of the beyond information literacy education system lies in professional knowledge and academic literacy capabilities supported by information literacy. Librarians take the lead in cultivating users' research and innovation literacy capabilities that embed information literacy within disciplinary fields, emphasizing tasks, scenarios, and needs while integrating information literacy education into practical applications for solving scientific research and knowledge innovation problems. Data, research, tools, ideas, writing, innovation, and ethics constitute the important supporting elements of this system.

Beyond information literacy education emphasizes that information literacy must be closely associated with specific disciplinary fields, scientific research projects, and teaching content. When divorced from such associations, information literacy education loses its "ontology," becoming merely empty theory and concepts, consequently losing its educational significance. Therefore, in today's information age, libraries should redesign the beyond information literacy education system based on new user needs, focusing on tool and platform literacy, research and academic literacy, digital and network literacy, intellectual property literacy, and metaliteracy. The progression from literature retrieval courses to information literacy education, and then to beyond information literacy education, represents not merely a conceptual change but a transformation in philosophy, educational orientation, and, more importantly, educational objectives, knowledge structure, and content system. The internal drivers of this series of changes primarily stem from users' elevated basic information literacy and professional knowledge literacy, which generate new demands for higher-level beyond information literacy. In turn, enhanced beyond information literacy improves users' research and innovation capabilities. A comparison between information literacy education and beyond information literacy education systems is presented in Table 1 .

2. Practice of Beyond Information Literacy Education at the University of Chinese Academy of Sciences

Since 2006, the National Science Library, Chinese Academy of Sciences (hereinafter referred to as "the Library") has established a team of subject librarians that "integrates into the frontlines and embeds into processes" to provide embedded subject services within users' research processes. Simultaneously, for the past 15 years, the Library has continuously offered beyond information literacy education courses for graduate students (and subsequently undergraduate students) at the University of Chinese Academy of Sciences (renamed from the Graduate University of Chinese Academy of Sciences in 2012, hereinafter referred to as "UCAS").

Initially, the Library primarily offered a 26-hour public elective course titled "Scientific and Technical Information Retrieval and Utilization" for all students (a public required course in some schools). Subsequently, especially since the establishment of the Department of Library, Information and Archives Management in the School of Economics and Management at UCAS in 2017 (which established the "Information Literacy Teaching and Research Office"), the Library has continued to offer "Practical Skills in Scientific and Technical Information Retrieval and Utilization" in both comprehensive and discipline-specific versions, while also developing various types of beyond information literacy education courses.

Based on statistics from the spring and fall semesters of 2019 alone, the National Science Library (Department of Library, Information and Archives Management) offered more than ten types of public required or elective courses in beyond information literacy education (excluding professional courses for library and information science majors). Each course type often included multiple sections. The main offerings included "Discipline and Technology Trend Analysis," "Scientific Data Management and Application," "Data Science with R and Python Practice," "Practical Statistical Data Analysis," "Patent Application and Patent Information Utilization," "Scientific Research and Paper Writing & Submission," "Research Integrity and Research Ethics," and "Academic Ethics and Academic Writing Standards" (see Table 2). Additionally, we developed an "Information Literacy Education Platform," organized the recording of MOOC series courses, and promoted the use of teaching methods such as "Rain Classroom" and "flipped classroom" [20].

Beyond information literacy education has consistently received strong support from the Library, the School of Economics and Management, and the UCAS Academic Affairs Office, expanding from the initial 1-2 courses to a curriculum system comprising more than ten types of beyond information literacy education courses. The teaching effectiveness has been generally excellent, with high student evaluations. Regarding our courses, students have commented: "I thought this course would be boring, but I gained a lot from it"; "The course was very rewarding and extremely useful." The Academic Affairs Office's evaluation stated:

"We are deeply grateful for the teachers' tremendous support. The teachers are dedicated and committed educators who truly care about teaching—a blessing for students and the university! The classroom teaching effectiveness is so remarkable, truly achieving the original purpose of offering these courses! We sincerely appreciate the teachers' hard work!"

We have offered beyond information literacy education courses for 15 years—a process of continuous experimentation, verification, reform, exploration, and development, with ongoing summarization of experiences and lessons in practice. The Teaching and Research Office continuously improves teaching content and methods through supervisory 听课 (classroom observation) and teaching discussions to enhance teaching quality. However, the lack of more high-level teaching staff remains the greatest challenge. Therefore, our efforts are ongoing. We must continuously optimize and expand the curriculum system under the objectives of beyond information literacy education, intensify faculty development, further improve teaching methods, and enhance teaching effectiveness to cultivate more high-level talents with information capabilities, research capabilities, and innovation capabilities.

3. Key Elements of the Transformation from Information Literacy to Beyond Information Literacy Education

3.1 Clarifying Educational Purpose

Information literacy education should not remain merely at the level of information retrieval, information analysis tool usage, or resource introduction, nor should it be limited to methodological and skill-based courses. From the perspective of information attributes, information literacy is absolutely not an isolated entity but an organic whole closely associated with context. If information literacy education is divorced from practical application contexts such as professional backgrounds, specific tasks, research projects, academic research, and concrete courses, then information becomes empty and ineffective. In the era of beyond information literacy education, information literacy education should be targeted and serve specific disciplinary fields and scientific research processes. It should provide customized and diversified information literacy education for different groups (students, faculty, researchers) based on their varied needs [21], and cultivate users' data literacy, information literacy, intelligence literacy, ethical literacy, writing literacy, research literacy, and innovation literacy that integrate into research according to their information needs in specific research processes. The ultimate purpose is to enhance users' ability to independently and effectively manage and utilize information in their professional fields and acquire more useful, valuable, and precise knowledge, strengthen their critical thinking abilities, enable them to capture and identify frontier hotspots in their fields in a timely manner, understand professional intellectual property knowledge, be familiar with academic ethics and writing standards, and continuously enhance their professional knowledge capabilities and research innovation capac-

ities.

3.2 Advancing Educational Goals

Over the past decades, due to changes in the information environment, the "self-service" capabilities of information retrieval systems have continuously optimized. Coupled with ongoing information literacy education, users' basic information literacy capabilities have continuously improved. Therefore, information literacy education cannot remain within existing models but must break through traditional frameworks and advance toward beyond information literacy education. In terms of educational resources, it must transcend the categories of "literature" and "libraries" and advance to media, information, data, tools, systems, and platforms integrated with specific contexts. In terms of teaching content, it must move beyond "literature retrieval," "information searching," and "library utilization" to encompass the utilization of literature management tools, information analysis tools, various system platforms, patent retrieval and analysis, discipline trend analysis, scientific data management, academic ethics and academic writing standards, etc. In terms of teaching methods, it must advance from cramming and spoon-feeding instruction to fully utilizing MOOCs, flipped classrooms [20], and other methods, strengthening interactive teaching, heuristic teaching, and immersive teaching. In terms of teaching approaches, it must advance from face-to-face classroom teaching and library-based training to timely use of networks and social media for remote teaching and multimedia instruction, guided by the philosophy of "wherever users are, services are there" [22] to achieve "wherever users are, information literacy education is there," providing users with beyond information literacy education unrestricted by time, location, or environment.

3.3 Shifting Educational Perspective

The most important change from ACRL's 2000 "Information Literacy Competency Standards for Higher Education" to the 2016 "Framework for Information Literacy for Higher Education" is the shift in perspective. The Standards emphasized the finding, evaluating, and using of information, whereas the Framework emphasizes using information to create new knowledge. The former centered on the utilization of information itself, while the latter focuses on the value generated by information in specific contexts. Only by stepping outside information itself and understanding and utilizing information from broader contexts can information literacy education become more meaningful. The Framework proposes that information literacy can only achieve its potential through a richer, more complex set of core concepts. Librarians bear greater responsibility to identify core concepts within their knowledge domain, expand educational content, establish new cohesive and structurally expansive beyond information literacy courses, and collaborate more extensively with faculty. By integrating many other concepts and ideas related to information, research, and scholarship, it emphasizes the integration of information literacy with the research and aca-

demic process. Only through such a perspective shift can information literacy education achieve fundamental transformation.

3.4 Demonstrating Educational Effectiveness

All education must consider its effectiveness, which is evaluated both through users' perceived evaluation and through evaluative assessment of users' knowledge expansion and capability enhancement. For years, information literacy education centered on information retrieval has featured a one-way transmission relationship between teaching and learning, with a disconnected and fragmented relationship between learning and application. Students often memorize numerous search formulas, strategies, and platforms but cannot integrate them into their professional knowledge systems and academic research processes, resulting in a situation where they understand everything during learning but are at a loss when applying it, creating an awkward mismatch between knowledge and capability. Beyond information literacy education must situate information literacy education within specific contexts, emphasizing the expansion and completeness of curriculum systems by designing a comprehensive set of courses to support the multifaceted integrated capabilities of information literacy (a combination of capabilities centered on information). It emphasizes learning through need and learning through process, focusing on learning effectiveness. The effectiveness of information literacy education should be tested through improvements in personal research capabilities, formation of innovative thinking, perfection of knowledge systems, enhancement of learning abilities, and improvements in task performance. This testing may come from students' perceptions or from proof in actual application scenarios. Ultimately, the significance and value of information literacy education must be proven through students' learning outcomes.

4. Implementation Strategies for Beyond Information Literacy Education

4.1 Establishing Progressive Goals for Beyond Information Literacy Cultivation

Different user groups, learning stages, and demand scenarios should establish different cultivation goals, adopt different methods, and set different curriculum systems for information literacy education. This is a continuous and ongoing learning and improvement process. The Society of College, National and University Libraries (SCONUL) in the UK proposed seven pillars of information skills in 1999, dividing them into five levels: novice, advanced beginner, competent, proficient, and expert [23], which was updated in 2011 as the seven pillars of information literacy as a core model for higher education information literacy education [24].

Drawing on foreign research findings and based on different objectives for domestic beyond information literacy education, this paper divides beyond infor-

mation literacy education into five stages, each with corresponding core capabilities, progressing from shallow to deep, from "novice" to "expert." The five stages of beyond information literacy education are: (1) Novice Stage: The entry-level phase where users first become aware of information literacy—a necessary foundation for subsequent in-depth education and a process of learning basic knowledge, focusing on general education and emphasizing the cultivation of literature retrieval, resource acquisition, and reading and writing abilities; (2) Beginner Stage: After foundational learning, users have preliminary cognition of information literacy and enter the stage of mastering information tools and applying certain skills and methods to solve specific problems; (3) Competent Stage: At this point, users have overcome their fear of information acquisition, analysis, and utilization and have developed correct abilities to cognize, screen, and judge information; (4) Proficient Stage: Users at this stage possess superb abilities to utilize information, can mine, select, and evaluate information within their professional fields, and handle professional problems with sound scientific thinking; and (5) Expert Stage: Users at this stage not only possess professional information literacy and professional knowledge and capabilities but can also participate in decision-making on major issues in their fields, provide expert consultation, and potentially propose problem solutions, fully playing the role of intelligence experts. This is illustrated in Figure 1 [Figure 1: see original paper].

4.2 Crossing and Transcending Disciplinary Boundaries of Information Literacy

For years, the role of information literacy education delivered by libraries through literature retrieval courses has not been sufficiently significant [25] because such education has been the sole responsibility of the single discipline of library and information science. Beyond information literacy education requires mutual influence, coordination, and symbiotic relationships among multiple disciplines. It necessitates close association and cross-integration between library and information science and many other disciplines in natural and social sciences (such as psychology, education, computer science, law, medicine, sociology, and ethics), fully demonstrating its capabilities and enhancing its visibility and contributions within them. It should provide beyond information literacy education tailored to diverse user needs and different disciplinary characteristics to enhance professional knowledge and capabilities, such as "embedding" into disciplinary resource utilization and thinking training, cultivating users' abilities to flexibly use professional databases, tools, and methods, and applying professional logic to think about and solve professional problems. It should support users in conducting evaluations of disciplines, institutions, and journals to comprehensively analyze and assess the competitiveness of evaluation objects, help users better understand their strengths and weaknesses, determine future development directions, and make reasonable adjustments. It should strengthen users' intellectual property awareness to legally protect their scientific research achievements and facilitate timely

transfer and transformation of results to promote industry-academia-research integration.

4.3 Expanding and Reforming the Content System of Information Literacy Education

The most important aspect of beyond information literacy education is the reform (structural transformation) of its content and system, expanding users' information literacy capabilities into beyond information literacy capabilities. The content system can be deepened in three main areas: (1) **Data Literacy and Capabilities:** As scientific research enters the fourth paradigm—the data-intensive paradigm—information literacy education must extend from general information literacy to scientific data literacy, cultivating and enhancing users' scientific data management capabilities and literacy throughout the data lifecycle, including data management planning, data production, data preservation, data sharing, and data reuse. (2) **Academic Communication Ecosystem:** The academic communication ecosystem comprises stakeholders including authors, readers, publishers, and academic societies. Beyond information literacy must support all parties and processes in academic communication, providing education on research topic selection, research methodology, paper writing, publication, academic evaluation, and academic ethics to ensure the healthy development of the academic communication ecosystem. (3) **Disciplinary Integration:** Disciplinary integration is an essential requirement of beyond information literacy education. Only through cross-integration with multiple disciplines, transforming information capabilities into capabilities of other disciplines, and supporting the innovative development of other disciplines can information have value and information literacy education have meaning.

4.4 Integrating New Educational Technologies and Methods

The ultimate effectiveness of information literacy education depends on both content and the technologies and methods applied. In the networked and digital era, beyond information literacy education should emphasize the application of new technologies and methods, permeating them into teaching models, processes, tools, and knowledge service systems, such as flipped classrooms [26], micro-lectures [27], and Rain Classroom [28], as well as enterprise-developed knowledge service systems like the Chaoxing Yunzhou Knowledge Space [29]. Whether in information literacy education or beyond information literacy education, continuously exploring the application of new educational technologies and methods is a crucial means of enhancing classroom teaching effectiveness. We must strengthen the comprehensive application of teaching technologies and methods, emphasize autonomous learning and interactive teaching, and give full play to students' principal role in the classroom.

4.5 Constructing Applicable Scenarios for Beyond Information Literacy Education

Beyond information literacy education needs to be combined with tasks, scenarios, and needs. The Chartered Institute of Library and Information Professionals (CILIP) proposed in its "CILIP Definition of Information Literacy 2018" (hereinafter referred to as the Definition) that information literacy has five contexts: information literacy in everyday life, information literacy in citizenship, information literacy in education, information literacy in the workplace, and information literacy in health [30]. This division emphasizes that information literacy has permeated people's learning, life, and work, playing a pivotal role in different scenarios—an ability everyone needs. Scenarios are diverse, and each scenario relates to information literacy and requires it to function.

4.6 Strengthening Spatial Configuration for Beyond Information Literacy Education

Whether in physical libraries, digital libraries, or future smart libraries [31], the transition from information literacy education to beyond information literacy education requires libraries to strengthen spatial configuration. Users need to closely integrate information literacy with writing spaces, research spaces, maker spaces, and collaborative innovation spaces. In such spaces, users can fully acquire needed professional knowledge, find research inspiration, cultivate innovative thinking, master research methods, share research processes, and obtain support from professional databases, tools, equipment, and librarians. Only with such spatial configuration can libraries comprehensively support the enhancement of users' knowledge, capabilities, and literacy. The proposal of beyond information literacy education does not replace information literacy education but requires us not to limit our vision to information itself or narrowly understand information. Instead, we must expand the boundaries of information literacy from the perspectives of users, tasks, scenarios, needs, and interdisciplinary integration, perfect the content and structural system of information literacy education, enhance its capabilities and effectiveness, and thereby more effectively support the research and innovation process. This represents a transformation from quantitative to qualitative change, extending and expanding from information literacy education centered on literature retrieval to beyond information literacy education centered on supporting research and innovation literacy capabilities.

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Author Contributions:

Chu Jingli: Conceived the paper outline, proposed main ideas, revised and finalized the manuscript;
Liu Jingyi: Drafted the paper and collected materials;
Zhang Dongrong, Li Ling: Reviewed and revised the paper.

Note: Figure translations are in progress. See original paper for figures.