Advances and Prospects in Domestic and International Information Literacy Education Research: A Five-Year Review (Postprint)

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Abstract

[Purpose/Significance] To review the current status of information literacy education research, reflect on major issues and provide prospects, aiming to offer references for future research and practice of information literacy education in university libraries in China. [Method/Process] Adopting a literature survey method, this study summarizes and synthesizes existing domestic and international information literacy education content and educational models, and analyzes the characteristics and experiences of these studies. [Results/Conclusion] By integrating the new environment, new theories, and the Framework for Information Literacy for Higher Education, the study expands educational content such as data literacy and metaliteracy; adopting a learner-centered approach, it seeks appropriate and diversified educational models such as "MOOC" and "flipped classroom"; and proposes seizing the new opportunities brought by the advent of the artificial intelligence era while monitoring emerging trends in information literacy education. (Please carefully verify the abstract section)

Full Text

Preamble

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Recent Developments and Future Prospects in Information Literacy Education Research: A Five-Year Review of Domestic and International Progress

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Abstract

[**Purpose/Significance**] This paper systematically reviews the current state of information literacy education research, reflecting on key issues and offering future perspectives to provide reference for subsequent research and practice in Chinese university libraries. [**Method/Process**] Through literature review, this study summarizes existing domestic and international information literacy education content and pedagogical models, analyzing their characteristics and implications. [**Results/Conclusions**] Building upon new environments, emerging theories, and the *Framework for Information Literacy for Higher Education*, the paper recommends expanding educational content to include data literacy and metaliteracy. From the learner's perspective, it advocates for adopting appropriate and diverse educational models such as MOOCs and flipped classrooms. The paper also proposes seizing new opportunities presented by the artificial intelligence era and monitoring emerging trends in information literacy education.

Keywords: Information Literacy; Data Literacy; Metaliteracy; MOOC; Flipped Classroom

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Information literacy is widely regarded as a fundamental competency for survival in the information age. Traditionally, it has primarily encompassed information awareness, retrieval, evaluation, and utilization. However, with the rapid development of information technology in the big data era and the continuous emergence of new media, information literacy has acquired new dimensions. The Society of College, National and University Libraries (SCONUL) in the UK interprets information literacy as a composite concept covering digital, visual, and media literacy, academic competency, information processing, information skills, data curation, and data management [1]. The Association of College and Research Libraries (ACRL) in the United States defines it as metaliteracy—the foundation for numerous other literacies [2].

These new environments and expanded definitions have triggered novel research directions in information literacy education. Yet comprehensive and systematic reviews and interpretations of recent domestic and international research remain scarce. Addressing this gap, this paper employs literature review methods to collect, organize, and analyze research outcomes and practical developments in information literacy education content and models from the past five years, offering reflections and future prospects to inform Chinese library information literacy education research and practice.

1. Data Sources and Analysis

1.1 Data Collection

To understand the current state of research on information literacy education content and models, the authors conducted preliminary searches of domestic and international literature from 2013–2017 using the keywords "information literacy" (in Chinese and English). The Chinese search formula included: "Title = information literacy education OR information quality education OR information quality teaching OR information literacy teaching OR information retrieval course OR literature retrieval course OR document checking course," limited to core journals and CSSCI sources in CNKI with exact matching. The English search formula was: "TS='information literacy' AND TI=(educat* OR teach*)," applied to the SSCI database in Web of Science. After deduplication and relevance screening, 142 Chinese and 86 English articles were obtained. Additional relevant documents were identified through surveys of domestic and international library associations, universities, and academic websites via Bing, bringing the total to 242 reference documents.

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1.2 Research Methods and Preliminary Topic Analysis

This study employed literature survey methods to investigate information literacy education literature from the past five years, extracting key themes and uncovering underlying insights. The process involved four steps: (1) defining the research scope and sample—242 documents related to information literacy education content and models; (2) selecting the analysis unit—each independent document; (3) establishing thematic boundaries, categorizing overlapping topics into broader themes such as grouping information literacy concepts, standards (frameworks), data literacy, and metaliteracy under "content fundamentals," and grouping "MOOC," "flipped classroom," embedded integration, and pedagogy under "model practices"; and (4) organizing, analyzing, and summarizing the data.

Preliminary analysis revealed that domestic research on information literacy education content and theoretical foundations has focused primarily on data literacy education, with increasing attention to metaliteracy. Applied practice research has concentrated on MOOC and flipped classroom teaching models. International research, by contrast, emphasizes teaching methods and embed-

ded integration models, with greater emphasis on empirical investigation than theoretical discussion.

2. Current Status of Two Major Research Themes

2.1 The Generalization, Deepening, and Specification of Information Literacy Education Content

As the information ecosystem evolves, information literacy has acquired new connotations, prompting shifts toward new competencies and abilities in education content, which has become increasingly rich.

(1) Expansion from Library-Based Literacy to Comprehensive Competencies Including Data Literacy, Metaliteracy, and Media Literacy

Data literacy education has gained significant attention. For example, MIT Libraries has built upon traditional information literacy education to establish resource guides for "Data: Finding and Managing" and general education courses on "Managing Research Data" [5]. The University of Queensland Libraries' "Managing Your Research Data" workshop covers data management planning, discovery tools, citation, and storage [6]. Cambridge University Library's social anthropology data management curriculum includes foundational data management, software, advanced courses, and reading materials [7]. Tsinghua University and Peking University libraries have implemented training focused on data retrieval and utilization.

Metaliteracy-related content has also attracted attention. Yale University, the University of Texas at Arlington, and the University of Toronto libraries have conducted metaliteracy orientation, counseling, and specialized courses for freshmen, covering information acquisition, utilization, and knowledge creation with particular emphasis on information transfer [8]. The State University of New York at Albany and Empire State College collaborated on metaliteracy education focusing on cognition, library awareness, collaborative information production, and metacognitive reflection [9].

Media literacy, research literacy, and other competencies have also entered the information literacy education domain. Professor Huang Ruhua notes that with the expanding concept of information literacy, education should extend to specialized skills such as data literacy, visual literacy, and media literacy [12]. S. McClellan et al. from the University of Louisiana incorporated scholarly publishing literacy into graduate library courses based on the Framework [13]. Tu Yingzhe and Liang Hong argue that in the Academic Research 2.0 environment, library information literacy education should encompass not only scientific data literacy but also academic information literacy related to scholarly publishing and altmetrics [14].

(2) Deepening from Information Retrieval Skills to Metacognitive and Research Competencies

To enhance critical thinking and self-reflection, the University at Albany Libraries established a motivational badge system and digital storytelling initiatives. The badge system includes not only traditional information acquisition and ethics but also specifically addresses critical information evaluation, adaptation, creation, and metacognitive reflection on failure and improvement, fostering learners' questioning and reflective abilities [15]. Digital storytelling involves information gathering (collecting images, audio, or video around a story), utilization and creation (producing works in multimedia formats), sharing (via social networks like Facebook), and self-reflection (metacognitive reflection on learning processes and outcomes based on feedback) [16].

Domestic scholar Zhang Changhai integrated interdisciplinary critical thinking cultivation into curriculum integration [17], while Zhang Li explored self-reflection ability development in the new media era [18]. Regarding research competencies, K. Seeber designed educational content for the "Format as a Process" threshold concept, focusing on: (1) discussing how scholarly literature is produced, researched, experimentally validated, and peer-reviewed; (2) distinguishing different information creation processes and teaching value judgment in evaluation; (3) engaging students in information creation through editing Wikipedia entries, blogging, and complex tasks like in-depth research and double-blind peer review; (4) using discovery platforms for knowledge migration; and (5) prompting reflection on how cited information is generated and whether understanding creation processes aids evaluation [19]. A. Burkhardt designed content for the "Research as Inquiry" threshold concept, including literature reading, mind mapping, keyword formation, and interviews, while having students conduct ethnographic background research and interviews to understand that research involves progressive questioning, investigation, and problem-solving [20]. Zhang Di also developed embedded information literacy teaching content from six threshold concepts, covering information knowledge instruction and information skills training in academic contexts [21].

(3) Broadening from University Students to the General Public and from Single to Multiple Stages/Levels

In the big data and new media environment, information literacy education is no longer limited to specific groups or stages but targets broader audiences and levels, with content adjusted accordingly. Purdue University Libraries designed three-stage (beginner, intermediate, advanced) information literacy learning content for different proficiency levels [22]. Zhang Qun et al. propose designing differentiated data literacy education content based on the five stages of the research data lifecycle and different user groups (undergraduates, graduates, faculty, researchers, and other data users) [23]. Huang Ruhua et al.'s "Information Retrieval" MOOC even includes modules for the general public and commercial applications, allowing learners to customize content [24].

2.2 Diversification of Information Literacy Education Models

Scholars have extensively researched information literacy education models from various dimensions. Recent models primarily include:

(1) General Education (Credit-Bearing) Course Models and Embedded Integration Models

From the perspective of engagement level, two basic models exist: general education (credit-bearing) courses and embedded integration. The latter has attracted more research attention. Embedded integration models can be categorized as: one-time embedding, phased embedding (including scalable and layered embedding), and full-process embedding. Examples include the University of Tasmania's layered teaching model and SUNY's scalable model [25], Shanghai Jiao Tong University's partial, tracking, and comprehensive integration models [26], and various embedded approaches by Peking University, Chongqing University, and Zhejiang University libraries for different disciplines and audiences.

International embedded integration research more often involves project- or program-based collaboration between librarians and disciplinary faculty, combined with surveys of student information literacy and academic abilities. For instance, B. Junisbai et al. conducted a three-year "faculty-librarian" collaboration project examining student information literacy and research abilities in academic writing, finding significant improvements in both areas [27]. Even without formal collaboration projects, disciplinary faculty often invite librarians to participate in teaching. Librarians post retrieval guides and videos on course websites, deliver in-class instruction, and provide ongoing guidance via networks, email, phone, or one-on-one consultation on topics like narrowing research scopes, developing search strategies, locating resources, and citation standards [28].

(2) MOOC, Flipped Classroom, and Hybrid Models

Recent pedagogical approaches include case-based methods, PBL, project-based teaching, MOOCs, flipped classrooms, and hybrid models. The latter have gradually become dominant, influencing the direction of information literacy education. Statistics show 36 information literacy MOOCs have been launched on domestic and international platforms, including Huang Ruhua's "Information Retrieval" and Luo Zhaofeng's "Literature Management and Information Analysis" in China. MOOC- and flipped classroom-based hybrid models continue to emerge, sharing common characteristics:

2.2.1 Theory-Based Foundation: Most models are grounded in constructivist learning theory (except MOOCs, which follow connectivist and behaviorist theories) [30]. These models emphasize active exploration, discovery, and knowledge construction in context, enhancing not only information retrieval but also awareness, analysis, utilization, collaboration, and innovation [31]. Additionally, situated learning theory, metaliteracy theory, and holistic philosophy have been applied to model construction.

2.2.2 Learner-Centered and Learning-Oriented: Information literacy education has shifted from teacher-centered to learner-centered and learning-oriented approaches. New models provide learners with autonomous learning space, cultivating self-directed learning habits while integrating content, process, evaluation, and outcomes. Wuhan University and Chongqing University have established learner-centered ecosystems supported by MOOC platforms, QQ groups, and WeChat. Southwest Jiaotong University's information retrieval course, as a national resource-sharing program, has built a model featuring competitive, exploratory, seminar-style, collaborative, and evaluative learning, fostering information retrieval, independent thinking, and knowledge innovation [31]. These models "fully respect students' autonomous learning space, enabling them to learn anytime and anywhere beyond the classroom and utilize fragmented time, thus being highly popular among students" [32].

2.2.3 Visualization, Mediatization, and Interactivity: MOOCs, flipped classrooms, and hybrid models have introduced numerous micro-videos and audio resources, enhancing visualization and appeal. G. Philip et al. found that MOOC videos attract learners, with those under six minutes being most engaging [33]. These models increasingly integrate with mobile, social, and digital media like tablets, smartphones, WeChat, and QQ. Most international MOOC platforms connect directly with social media (Twitter/Facebook) [34], while Huang Ruhua's "Information Retrieval" MOOC incorporates micro-videos, audio, and QR code-linked e-textbooks [24].

Interactivity has become essential. Pre-class and in-class online exchanges, evaluation systems, and post-class social media integration (QQ, forums, WeChat) have become standard features of MOOC and flipped classroom hybrids, promoting active learning and resource accumulation. Tsinghua University Library innovated its flipped classroom model through "Rain Classroom," enabling synchronous PPT delivery, anonymous "confusion" feedback, bullet-screen interactions, and in-class quizzes. In Luo Zhaofeng's MOOC, learners interact with teaching assistants via chat boxes during live videos, with instructors participating in real-time post-class discussions [35].

2.2.4 Gamification: Increasingly, games are being incorporated into information literacy training and instruction. Approaches include online virtual games (e.g., Carnegie Mellon's *I'll Get It* and *Within Range*, Michigan's *Defense of Hidgeon*, Wuhan University's *Save Xiaobu*, Tsinghua University's *Secret Language of Books*) [36] and physical games (e.g., Pennsylvania State University's puzzle game [37], National Taiwan University's Monopoly [38], and Southwest Jiaotong University's classroom quiz competitions [31]). These games, especially when implemented through flipped classrooms, reinforce knowledge of citation management software and library resources, enlivening classroom atmosphere and improving learning outcomes.

2.2.5 Diversified Evaluation: Model effectiveness is evaluated through experimental comparison, questionnaires, and interviews. A. Brooks at Northern Kentucky University compared flipped classroom and traditional models,

finding the former more popular and effective, particularly in improving academic citation practices [39]. Long Xi conducted similar experiments at East China Normal University, demonstrating that flipped classrooms enhance student interest and performance [30]. Questionnaires, such as those used in Huang Ruhua's MOOC, evaluate courses across dimensions like content design, teaching skills, materials, teaching assistants, and assessment design, yielding high scores without significant weaknesses [24].

3. Problems and Prospects

While scholars have made important progress in information literacy education research, new information literacy connotations and metaliteracy theories continue to develop, particularly with the ACRL Framework. Chinese information literacy education content and models require ongoing refinement.

3.1 Expanding and Deepening Information Literacy Education Content in Conjunction with New Environments, Theories, and the Framework

3.1.1 Strengthening Data Literacy and Metaliteracy Education: International research has successfully implemented scientific data literacy, metaliteracy, and research literacy education based on big data, new media environments, metaliteracy theory, and the Framework, establishing a foundation to meet diverse user needs. Chinese information literacy education has only just begun addressing these areas, with few successful qualitative explorations. We must learn from international experiences to gradually expand and practice data literacy and metaliteracy education, including awareness and introductory content, software and new media tool training, metadata and metacognitive analysis, ethical education on data and scholarly publishing, and even non-specialist AI education through experiential case studies introducing AI concepts, applications, and prospects to stimulate interest and development awareness while exercising information thinking.

3.1.2 Emphasizing Critical Thinking, Self-Reflection, and Research Competencies: The shift from "skill-based" to "thinking-based" and "wisdom-based" education represents a key trend. Current Chinese information literacy education remains largely limited to information retrieval skills, lacking depth in information evaluation, analysis, and creation [40], particularly regarding critical thinking and reflective learning. We need practical explorations such as using concept maps and mind maps for preliminary thinking training to evaluate, select, analyze, and synthesize fragmented information into logical frameworks, enhancing self-awareness in information judgment. Learners should engage in critical analysis, evaluation, reflection, and feedback on cases, video works, and search reports to develop deeper critical reflection and ethical values.

For graduates, new faculty, and researchers, "research-oriented" content should include: basic retrieval skills, literature and data management, understanding of

copyright and patent regulations, data literacy across the research lifecycle, independent research project training, academic paper writing, and publishing in influential journals. For librarians and data management professionals, targeted training content should be developed.

3.1.3 Establishing Differentiated, Multi-Level Content by Audience and Stage: Under new theories and the Framework, we should reconstruct knowledge and competency frameworks for undergraduates, graduates, faculty, researchers, librarians, and the public, creating flexible, multi-dimensional content systems such as "general education," "research-oriented," and "public" types to support varied learning depths.

For undergraduates, three stages of "general education" content can be implemented: (1) Foundational stage (especially for freshmen) covering cognitive and behavioral basics—library, data, and metaliteracy awareness, resource retrieval, academic norms, and new media tools; (2) Intermediate stage introducing information management, analysis, and metacognition—critical evaluation (including questioning authority), preliminary scientific thinking, and self-reflection; (3) Advanced stage incorporating specialized data literacy skills and strengthening critical thinking, scientific methodology, and information ethics, including AI literacy for non-specialists.

3.2 Learner-Centered Approaches and Appropriate, Diverse Models

3.2.1 Shifting from "Teaching" to "Learning": Current models insufficiently address how learners actually learn. We must strengthen comprehensive consideration of student needs, characteristics, and learning patterns. While MOOCs, flipped classrooms, and embedded models partially address the teaching-learning relationship, research on learners' internal cognitive processes, methods, and strategies remains inadequate. Understanding mechanisms of critical thinking development, specific thinking skills, effective self-reflection, group collaboration, and personalized guidance will enable models to maximize learner agency and cultivate creative thinking, truly transforming education from "instruction paradigm" to "learning paradigm."

3.2.2 Integrating MOOCs, Moving Toward Embedded Models, and Employing Multiple Models: As American educator B. Joyce noted, truly effective teaching combines a series of models [41]; no single model is universal. Information literacy education requires open, compatible, diverse models that blend extracurricular MOOC or flipped classroom learning with traditional instruction, emphasizing both general education and disciplinary embedded integration, including integration with professional courses and research workflows. Through co-created scenarios and participatory activities, these models promote sustainable learner development.

Future models will feature enriched characteristics: playfulness (through games, competitions, microfilms, micro-videos, micro-works, Rain Classroom, and WeChat-based platforms like "Micro Assistant Teaching" to enhance

interaction and engagement), mediatization (appropriately using interactive web pages, apps, QR codes, and other Internet+ technologies while maintaining rational tool use), interactivity (establishing substantive, long-term relationships through social media consultation, discussion, collaborative production, sharing, and feedback), and practicality (addressing real needs like coursework, research projects, modeling competitions, and patent applications to provide authentic experiences).

3.3 Seizing AI Era Opportunities and Monitoring New Trends

The rapid development of AI is profoundly impacting information civilization. In October 2016, the U.S. White House and National Science and Technology Council released *Preparing for the Future of Artificial Intelligence* [42], signaling national-level AI planning. In May 2016, China's NDRC, Ministry of Science and Technology, Ministry of Industry and Information Technology, and Cyberspace Administration jointly issued the *"Internet Plus" AI Three-Year Action Implementation Plan* [43].

To address AI's impending impacts, information literacy education must actively integrate AI-related content to prepare for this new era while monitoring AI-driven trends, particularly mental analysis functions that can grasp learner characteristics to form a "super brain" for information literacy education, providing more personalized content and models.

In conclusion, under big data and new media environments, information literacy connotations are gradually updating, new theories continue emerging, and information literacy standards (frameworks) are iteratively improving, granting libraries greater freedom and openness. Transforming mindsets, expanding innovation, and seeking more appropriate and diverse content and models to promote lifelong learner development represent the shared direction for future information literacy education institutions and practitioners.

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An Overview of Research on the Information Literacy Education in Domestic and Foreign Countries in Recent Five Years

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Abstract: [Purpose/significance] This paper systematically summarizes the research status of information literacy education. In order to provide reference for the future research and practice of information literacy education in China's university libraries, the main problems are thought and expected. [Method/process] By the methods of literature research, this paper sums up and summarizes the existing information literacy education content and education mode at home and

abroad, and analyzes the characteristics and experience of these studies. [Result/conclusion] This paper provide the following recommendations: we should combine with the new environment, new theory and "Framework for Information Literacy for Higher Education" to develop the content of information literacy education, such as data literacy and metaliteracy, seek appropriate and diverse education mode, such as MOOC and flipped classroom, from the learning perspective of learner, grasp the development opportunity in the AI era and focus on the new trend of information literacy education.

Keywords: information literacy; data literacy; metaliteracy; MOOC; flipped classroom

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