

Postprint: Analysis of Thematic Structure and Development Trends of Information Literacy Research in China

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Abstract

[Purpose/Significance] In the new era, information literacy or data literacy will become a core competency element for personnel across all sectors of society. By systematically reviewing the phased developmental trajectory of information literacy research themes in China, this study aims to reveal the thematic structure of domestic information literacy research and analyze future development trends. [Method/Process] Using 6,230 Chinese core journal papers indexed in CNKI as the data source, this study employs a logistic growth function to divide Chinese information literacy research into four stages, maps the thematic evolution path of domestic information literacy research over the past 30 years based on the BERTopic model, and conducts stage-specific analyses of thematic structure and development trends. [Results / Conclusion] Chinese information literacy research and practice directions continue to evolve with changes in the technological environment, demonstrating the following development trends: university libraries, as the primary institutions for information literacy education, maintain sufficient environmental sensitivity; the focus of information literacy education shifts from information skills training to information awareness cultivation; the target audience for information literacy education extends from student populations to the general public; and people's cognition of the essential attributes of information resources continues to improve, with deepening understanding of data elements.

Full Text

Thematic Structure and Development Trend Analysis of Information Literacy Research in China

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Abstract:

[Purpose/Significance] In the new era, information literacy and data literacy have become core competency requirements for professionals across all sectors of society. By examining the developmental trajectory of information literacy research themes in China, this study aims to reveal the thematic structure of domestic information literacy research and analyze its future development trends. **[Method/Process]** Using 6,230 Chinese core journal papers indexed in CNKI as the data source, a logistic growth function was employed to divide China's information literacy research into four stages. The BERTopic model was applied to map the thematic evolution paths over the past 30 years, with stage-by-stage analysis of thematic structures and development trends. **[Result/Conclusion]** China's information literacy research and practice have continuously evolved alongside technological environments, demonstrating four key trends: (1) University libraries, as the primary institutions for information literacy education, maintain strong environmental sensitivity; (2) The focus of information literacy education has shifted from skill-based training to awareness cultivation; (3) Target audiences have expanded from student populations to the general public; and (4) Societal understanding of the elemental attributes of information resources continues to deepen, with evolving comprehension of data elements.

Keywords: Information literacy; BERTopic model; Thematic structure; Development trend

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Information literacy, also known as “information competence,” “intelligence competence,” or “intelligence literacy,” was first proposed by Paul Zurkowski in 1974. Subsequently, American information management expert Forest W. Horton, Jr. and the American Library Association (ALA) further elaborated on this concept [?]. In the 1980s, Chinese scholars began discussing related issues such as intelligence competence [?], intelligence literacy [?], and intelligence awareness [?], marking the inception of information literacy exploration in China. At that time, document retrieval and utilization courses had been promoted domestically for many years, sparking heated discussions among Chinese scholars. Synthesizing various interpretations of information literacy definitions and connotations by scholars including Zheng Jianming et al. [?], Liu Xiaowen et al. [?] proposed three essential components of information literacy: information awareness, information knowledge, and information skills, noting that information literacy is a dynamic concept that continuously enriches and improves with technological development and changing social demands. Pan Yantao et al. [?] argued that information literacy broadly refers to an adaptive capacity for the information society, encompassing information awareness, knowledge, capabilities, and application. As a core competency in the information age, emerging concepts such as data literacy [?], media literacy [?], metaliteracy [?], and al-

gorithmic literacy [?] have gradually integrated into the research scope of information literacy, while the rapid development of artificial intelligence technology has recently given rise to AI literacy [?].

These interconnected literacy concepts have prompted the continuous refinement of information literacy with temporal and environmental developments, now encompassing not only technical understanding and application but also ethical issues, privacy protection, and awareness of social impacts. This evolution from macro-level information literacy to subdivided multi-literacies reflects the profound influence of information technology on society and demonstrates how information users actively adapt to, transform, and create objective information environments through subjective initiative.

In recent years, scholars have employed various methods to investigate and detect the thematic structures, research characteristics, developmental stages, and evolutionary trends in this field [?], while others have reviewed, reflected upon, and forecasted practical information literacy work in China [?]. Most existing studies have relied on empirical judgment, relevant policy texts, or representative events for stage division. This paper attempts to use the mathematical characteristics of logistic growth functions as the basis for periodization, applying the BERTopic model to comprehensively review domestic information literacy research literature, reveal the thematic structures across different developmental stages, analyze the evolutionary trends of each theme, and provide a new perspective for understanding the theory and practice of information literacy in China.

1.1 Publication Volume of Information Literacy Research in China

In the CNKI Journal Full-text Database, a professional search was conducted using “information literacy” OR “information competence” as subject terms. To ensure sample representativeness, the literature source was limited to core journals, with the search conducted on March 21, 2024. This yielded 7,644 records. After removing duplicate literature, conference announcements, meeting minutes, book reviews, and non-Chinese literature, 6,230 valid records were obtained, with their bibliographic data and abstract texts batch-downloaded as analytical samples. CNKI search results show that the first journal paper explicitly themed “information literacy” or “information competence” was published in 1995. Taking this year as the statistical starting point and organizing chronologically, the number of papers grew steadily from 1995 to 2010, remaining generally stable with fluctuations over the subsequent decade.

1.2 Development Stage Division of Information Literacy Research in China

Logistic growth patterns are suitable for describing information or knowledge growth [?]. This study employs logistic functions to delineate and decompose

different stages of knowledge accumulation and growth in the “information literacy” field, analyzing cumulative patterns and thematic evolution trends. Based on the annual growth of Chinese information literacy research literature, cumulative publication counts were fitted to a logistic curve, yielding the logistic function shown in Formula (1):

$$t() =$$

Herein, when the constant parameters of the logistic function are $K = 6,565.7213$, $a = 85.8758$, and $b = 0.2314$, an ideal fit is achieved (coefficient of determination $R^2 = 0.9951$). Through calculation, the velocity function of the curve reaches its extremum at $t(\ln)/19.2433$, with two inflection points at $1.317)/24.9348$ and $t(1.317)/13.5519$. These three time points divide the development of the “information literacy” field over the past 30 years into four stages (Period, hereinafter “P”). After numerical rounding, the stage division for China’s information literacy research is obtained (Table 1).

Table 1 Development Stage Division of Information Literacy Research in China

Stage	Time Period	Papers (n)	Proportion (%)
P1	(0, t_1)	1,626	26.10
P2	(t_1 , t_H)	1,586	25.46
P3	(t_H , t_2)	1,583	25.41
P4	(t_2 , $+\infty$)	1,435	23.03

Note: Since 2024 data is incomplete, paper counts are excluded from stage division; however, 2024 publications are retained in thematic analysis below and assigned to Stage 4.

As shown in Table 1, the four stages exhibit relatively balanced publication volumes. The fitted logistic curve L and actual annual cumulative data produce the cumulative growth curve fitting effect diagram for China’s information literacy field (Figure 1 [Figure 1: see original paper]).

Figure 1 Cumulative Growth Curve Fitting Effect Diagram of China’s Information Literacy Field

Based on these statistics, “information literacy” represents a long-term concept with stable overall growth, being representative of information resource management disciplines, possessing distinct temporal characteristics, and demonstrating broad influence and sustained duration. Logistic functions can mathematically capture the intrinsic logic of information literacy development, identifying different growth rates and critical nodes across stages, thereby quantitatively dividing research phases through objective literature accumulation.

2.1 BERTopic-Based Research Topic Mining

BERTopic is a flexible topic modeling method based on BERT word embeddings [?]. Compared with traditional algorithms such as LDA, NMF, and Top2Vec, BERTopic integrates BERT pre-trained embeddings, semantic similarity-based document clustering, and c-TF-IDF topic representation, demonstrating superior performance [?] with higher thematic consistency and diversity, while its dynamic topic modeling results offer interpretability for trend analysis [?]. Given the long temporal span and complex disciplinary attributes of our data, conventional bibliometric and text mining methods struggle to reveal implicit themes and development trends. Therefore, this study uses the developmental stages derived from logistic growth patterns as statistical units, applying BERTopic to mine implicit themes across different stages and analyze evolutionary trends.

First, text mining was performed on titles and abstracts from each stage in Table 1 for thematic structure detection. In a Python 3.9 environment, pandas 2.2.0 and jieba 0.42.1 were used for data preprocessing including deduplication, word segmentation, and stop-word removal. The open-source pre-trained Chinese word vector model sgns.sogou.word.bz2 served as BERTopic's embedding model. Finally, bertopic 0.16.0 and gensim 4.3.2 conducted model training and output.

Referencing existing research and comparing multiple modeling results, BERTopic parameters were set as follows: UMAP embedding dimensionality reduction ($n_{\text{components}} = 60$; minimum distance between data points ($\min_{\text{dist}} = 0.01$; HDBSCAN minimum cluster size ($\min_{\{\{\text{cluster}\}\{\text{size}\}\}} = 50$; *minimum samples parameter* ($\min\{\text{samples}\} = 30$, indicating a data point must be within the neighborhood of at least 30 other points to be considered a core point; all other parameters used default values.

Stage-specific corpus experiments yielded major discussion topics in China's information literacy research across different periods, as shown in Table 2. Topics are numbered from 0, with "-1" marking unclustered literature treated as noise and labeled "Unclassified." Successfully mined topics cover 65.68% of total samples, providing good coverage for further analysis.

Table 2 Research Topics in Different Stages of China's Information Literacy Field

Stage	Topic ID	Count	Topic Name	Representative Terms
P1	-1	113	Unclassified	information, education, literacy, competence, university, library, training, learning, quality education, network, teaching

Stage	Topic ID	Count	Topic Name	Representative Terms
	0	113	University Library Information Competence Education	university, library, information, quality education, education, literacy, college students, competence, analysis, implementation
	1	113	Comparative Information Literacy Research (T1)	USA, information, research, quality education, education, competence, library, literacy, standards, development
	2	113	College Student Information Literacy (T2)	college students, information, training, literacy, quality education, students, competence, education, graduate students, normal university students
	3	113	Information Competence Level (T3)	level, information, teachers, improvement, competence, literacy, survey, education, informatization, analysis
	4	113	Information Technology Education (T4)	information, education, literacy, information technology, curriculum, teaching, learning, teachers, students, development
	5	113	Information Literacy Curriculum Design (T5)	core, education, students, information technology, center, learning, information, training, enterprise, literacy
	6	113	Information Technology Curriculum Reform (T6)	teaching, information technology, integration, education, culture, literacy, curriculum, model, information, implementation

Stage	Topic ID	Count	Topic Name	Representative Terms
	7	113	Information Literacy Connotation and Theory (T7)	information, archives, competence, literacy, article, innovation, proposal, quality education, development, personnel
	8	113	Information Equity Issues (T8)	rural, development, community, western, region, informatization, farmers, primary/secondary schools, analysis, status quo
	9	113	Public Information Literacy (T9)	information, library, harmony, education, digital, literacy, informatization, resources, librarians, competence
	10	113	Teacher Education (T10)	establishment, education, information, teaching, discipline, teaching theory, e-commerce, curriculum, service, literacy
	11	113	Government Informatization (T11)	politics, ideology, government, work, network, competence, information, governance, construction, youth
	12	113	Information Ethics (T12)	network, moral education, ethics, moral quality, college students, model, content, information, ethical morality
P2	-1	113	Unclassified	information, literacy, education, research, library, university, competence, training, analysis, college students

Stage	Topic ID	Count	Topic Name	Representative Terms
	0	113	Information Literacy Education (T0)	informatization, teaching, information technology, education, teachers, learning, curriculum, construction, development, students
	1	113	University Library Services (T1)	service, library, discipline, librarian, university, space, sharing, resources, knowledge, embedded
	2	113	College Student Information Literacy Education (T2)	information, literacy, college students, education, training, status quo, analysis, students, competence, survey
	3	113	Online Information Literacy Education (T3)	quality education, information, university, library, competence, status quo, analysis, implementation, proposal, development
	4	113	Government Information Literacy (T4)	information, government, resources, consumption, demand, library, vulnerable groups, acquisition, public, service
	5	113	Information Literacy Bibliometric Analysis (T5)	research, field, analysis, hotspots, journals, literature, implementation, information, keywords, library science
	6	113	Online Public Opinion (T6)	network, Weibo, public opinion, literacy, college students, internet, media, development, aesthetics, cognition
	7	113	Vocational Student Information Literacy (T7)	vocational, institutions, students, information, literacy, status quo, quality education, library, analysis, survey

Stage	Topic ID	Count	Topic Name	Representative Terms
P3	8	113	Information Literacy Evaluation (T8)	evaluation, standards, indicator system, information, literacy, competence, health, research, indicators, implementation
	9	113	Comparative Information Literacy Research (T9)	education, library, freshmen, university, general education, development, training, format, content, USA
	10	113	Media Literacy (T10)	media, literacy, education, citizen, information, information age, Europe, language skills, implementation, games
	-1	113	Unclassified	information, literacy, education, research, teaching, learning, analysis, students, college students, university
	0	346	University Library Disciplinary Services (T0)	library, service, university, discipline, reading, resources, development, information, analysis, construction
	1	113	Information Literacy Evaluation (T1)	literacy, information, education, framework, evaluation, standards, media, university, library, research
	2	113	Primary/Secondary & Vocational Information Literacy (T2)	informatization, teachers, education, development, construction, internet, teaching, profession, information technology, leadership
	3	113	Information Retrieval Courses (T3)	curriculum, teaching, students, core, literacy, information, information technology, training, practice, learning

Stage	Topic ID	Count	Topic Name	Representative Terms
P4	4	113	Information Literacy Bibliometric Analysis (T4)	research, impact, information, field, analysis, model, methods, implementation, literature, search
	5	113	Digital Literacy (T5)	literacy, education, digital, research, library, university, development, scientific research, analysis, mathematical statistics
	6	113	Information Literacy Teaching Methods (T6)	learning, flipped, classroom, teaching, classroom instruction, students, research, teaching model, practice, model
	7	113	Information Equity Issues (T7)	information, consumption, acquisition, migrant workers, college students, poverty, public sector, analysis, demand, security
	8	113	Health Information Literacy (T8)	health, residents, level, literacy, degree, electronic, search, information, culture, impact
	9	113	Library Academic Publishing (T9)	publishing, academic, education, library, university, literacy, American universities, training, development, digital
	-1	113	Unclassified	literacy, library, information, education, university, teachers, teaching, digital, learning, research
	0	113	Health Information Literacy (T0)	health, information, impact, research, literacy, network, methods, false information, residents, analysis

Stage	Topic ID	Count	Topic Name	Representative Terms
	1	113	Information Literacy Education (T1)	informatization, education, development, policy, construction, digitalization, rural areas, teachers, era, information technology
	2	113	Comparative Information Literacy Research (T2)	information, literacy, education, library, university, research, development, practice, content, analysis
	3	113	Information Literacy Bibliometric Analysis (T3)	research, library, field, theme, literature, analysis, hotspots, development, trends, methods
	4	113	Digital Literacy (T4)	literacy, digital, education, research, framework, citizen, university, training, concept, library
	5	113	Information Literacy Teaching Methods (T5)	curriculum, teaching, literacy, teachers, core, discipline, training, information technology, information, students
	6	113	University Library Services (T6)	service, library, university, support, discipline, learning, embedded, innovation, librarians, MOOCs
	7	113	Online Teaching (T7)	learning, teaching, impact, teachers, students, research, engagement, learning effectiveness, support, space
	8	113	Emergency Public Health Information Services (T8)	emergency, library, service, pandemic, public health, pneumonia, outbreak, event, WeChat, COVID-19

Stage	Topic ID	Count	Topic Name	Representative Terms
	9	113	Library Health Information Literacy (T9)	health, service, library, public, information, survey, research, medicine, universal, Ireland
	10	113	University Library Intellectual Property Services (T10)	intellectual property, service, university, patent, information, service center, library, development, national, content
	11	113	Metaliteracy (T11)	education, literacy, university, practice, library, activities, model, fake news, cultivation, symbiosis
	12	113	Healthcare Industry Information Literacy (T12)	nurses, innovation, nursing, scales, specialties, nursing staff, operating room, new recruits, information, work

2.2 Thematic Structure Analysis of Information Literacy Research Across Stages

As shown in Table 2, 47 topics were identified across the four stages, some demonstrating continuity while others exhibiting stage-specific characteristics.

Intertopic distance maps for each stage visualize distances and clustering among topics. By merging these chronologically, we created a 30-year thematic evolution path diagram for China's information literacy research (Figure 2 [Figure 2: see original paper]). The diagram comprises four subfigures from left to right (P1, P2, P3, P4). Identifiable topics appear as circular nodes, with size proportional to document count (T1, T2, T3...corresponding to Table 2). Inter-node distances indicate similarity—closer proximity means higher thematic similarity. Overall, BERTopic-generated topics are well-distributed in feature space with clear boundaries, indicating high independence and effective differentiation.

Figure 2 30-Year Thematic Evolution Path Diagram of China's Information Literacy Research

Figure 2 reveals distinct thematic clusters across four stages, illustrating macro-level evolution paths. Combined with representative terms from Table 2, we

can analyze each stage' s thematic structure through literature review using macro-micro integration.

2.2.1 Stage 1 Thematic Structure Analysis

The first Chinese paper on information literacy education indexed in CNKI was published in 1995 [?], though earlier discussions on intelligence competence existed. Additionally, the Ministry of Education issued three directives on document retrieval courses in 1984, 1985, and 1992, representing early information literacy education practice. Figure 2 shows Stage 1 topics clustering into three groups.

The largest cluster comprises T0, T3, T4, T6, T7, T10, and T12, systematically discussing information literacy education: conceptual definitions and basic theory (T7), relationships between information institutions like university libraries and information literacy (T0), information literacy evaluation (T3), information capability cultivation through document retrieval and IT courses (T4, T6), information literacy teacher education (T10), and information ethics cultivation (T12). College student information literacy education includes theoretical research (T2) and applied methods (T5), covering university document retrieval curriculum and pedagogical reforms. Other research includes comparative studies (T1), information equity in underdeveloped regions (T8), public information literacy (T9), and government informatization (T11).

College student information literacy education formed Stage 1' s core, with university libraries as crucial training bases [?, ?] and information literacy education representing libraries' educational functions. Services and librarian education for information literacy became key concerns [?]. Through comparative analysis of international theories and cases, library and education scholars achieved significant results in defining, conceptualizing, measuring, and evaluating information literacy [?, ?]. Concurrently, disciplines explored integrating information awareness and capabilities into professional curricula to drive teaching reforms [?]. Given information environments' universal social impact and information literacy education' s hierarchical nature, scholars also addressed equity issues across vocational [?], primary/secondary [?], rural, and western regions [?], as well as various industries and the general public.

2.2.2 Stage 2 Thematic Structure Analysis

Stage 2 demonstrates thematic continuity through T1, T2, T8, and T9. T1 extends Stage 1' s university library information competence education (T0), focusing on libraries' educational functions and service models. Web 2.0 transformed library services, making embedded services and disciplinary service concepts key research areas [?], while information commons became a hotspot [?]. T2 continues college student information literacy (T2) from Stage 1, incorporating curriculum design (T5) to address new network environment challenges with specialized methods for targeted student groups [?]. T8 continues information

competence level (T3) from Stage 1 but shifts from qualitative measurement to quantitative evaluation based on empirical data [?]. T9 continues comparative information literacy research (T1), focusing on international comparisons.

Stage 2's information literacy education (T0) synthesizes Stage 1's IT education (T4), curriculum design (T5), curriculum reform (T6), and teacher education (T10) into research on education models and methods. These previously separate themes merged and developed new directions for the internet, Web 2.0, and new media in knowledge services, lifelong learning, and distance education [?]. T4 synthesizes Stage 1's information equity (T8), public information literacy (T9), and government informatization (T11) into public information literacy and equity [?], as proper government information resource openness and utilization became necessary for bridging digital divides.

The most significant new theme was online information literacy education (T3) [?], where interactive network environments transformed traditional face-to-face instruction into distance education transcending 时空 constraints. For online education, information literacy serves as both condition and objective, leading educational technology research. Bibliometric studies of information literacy formed a substantial body of work, dynamically reflecting the field's intellectual structure and evolution as information literacy bibliometric analysis (T5). Vocational student information literacy (T7) reflected the distinct applied and technical characteristics of China's vocational education system. Online public opinion (T6) and media literacy (T10) represented adaptation to rapidly changing network environments and media forms [?].

2.2.3 Stage 3 Thematic Structure Analysis

In 2015, the State Council's "Guiding Opinions on Actively Promoting 'Internet Plus' Actions" confirmed the internet's core status in informatization, driving integration and innovation across industries. Information literacy education became a crucial prerequisite for the "Internet Plus" initiative, forming Stage 3's central theme. Thematic continuity appears in T0 (extending Stage 1's university library education and Stage 2's library services), T1 (extending comparative research from Stages 1-2 with focus on public literacy and network-era evaluation), and T7 (extending Stage 1's equity issues and Stage 2's government literacy) emphasizing information poverty alleviation for disadvantaged groups [?]. T4 continues bibliometric analysis from Stage 2.

Stage 3's information literacy education expanded beyond batch promotion to all educational levels. Primary/secondary and vocational information literacy (T2) addressed education models across levels, notably reflecting on reforms under the "Internet Plus" initiative, continuing some methods from Stage 2's online education (T3). The 30th anniversary of document retrieval courses in 2014 prompted innovation in content and philosophy under new information environments, with MOOC-social media integration as key focuses [?]. Information literacy teaching methods (T6) explored innovations like flipped classrooms,

cloud classrooms, collaborative learning, and mobile learning [?]. These three themes constitute Stage 3' s information literacy education cluster.

New directions emerged in Stage 3: digital literacy for all society (T5) [?] and health information literacy (T8) [?] were introduced from abroad. Library academic publishing for knowledge producers (T9) [?] was also proposed as a special form of university library information service.

2.2.4 Stage 4 Thematic Structure Analysis

Stage 4 shows pronounced environmental influences. Health information literacy (T0) rapidly became a priority due to COVID-19 [?], emphasizing public general education. Libraries and information institutions continued dominating health information literacy education, services, and research, as seen in emergency public health information services (T8) [?], library health information literacy (T9) [?], and healthcare industry information literacy (T12) [?]. Under the “Opinions on Accelerating Intellectual Property Information Public Service System Construction,” university library IP information services (T10) and IP education also became priorities [?].

While student-focused information literacy education characterized previous stages, Stage 4 equally emphasizes public education. Information literacy education (T1) and university library services (T6) continue earlier themes. Information literacy teaching methods (T5) and online teaching (T7) form the methodological cluster, with remote online education as a curriculum reform hotspot and advanced concepts like ideological-political education integration being explored [?]. Comparative research (T2) and bibliometric analysis (T3) maintain continuity. Digital literacy (T4) leads research frontiers with technological updates [?], while metaliteracy (T11) and AI literacy continuously enrich information literacy' s connotation, demonstrating its vitality and broad development space [?].

3 Development Trend Analysis of China' s Information Literacy Research

The four-stage thematic analysis reveals developmental patterns and regular trends in China' s information literacy research.

3.1 University Library Information Services Advancing with the Times

China' s information literacy practice preceded theoretical research. In 1981, the National University Library Committee established by the Ministry of Education issued guidelines positioning university libraries as primary institutions for document retrieval courses, laying the practical foundation [?]. By 1995, document retrieval courses were universal in Chinese universities. In 1998, the

information competence concept gained popularity by integrating quality education concepts. The 2002 “Regulations on University Library Operations (Revised)” formally aligned document retrieval course promotion with macro-level information literacy education.

University library-centered information literacy education exploration has persisted across all stages, generating new themes and differentiation. Stage 2 shows Web 2.0 enabling interactive services [?], virtual reference [?], information commons, and Library 2.0 as hotspots, while distance education, autonomous learning, and embedded services demonstrated innovative evolution. Mobile internet and ubiquitous data environments complicated information needs, with scattered new concepts converging toward smart library services in Stage 3. Beyond courses, reading promotion increased, while MOOCs expanded boundaries and pushed specialized education toward general education.

Stage 4 saw university library topics differentiate further. Smart transformation, data services, and disciplinary services remained hot topics, with “Double First-Class” university services becoming distinctive [?] and emerging functions like teaching support, learning support, and academic integrity services emerging [?], representing a shift from document retrieval teaching to embedded information literacy services.

In summary, China’s university libraries have advanced smart construction alongside technological development while expanding from document retrieval instruction to emerging service models with embedded and integrated elements.

3.2 Information Literacy Education Shifting from Skills to Awareness

Continuous thematic clusters identify this evolution. Stage 1 focused on capability cultivation through document retrieval and IT courses, plus textbook development, pedagogical planning, and teacher education. Education scholars explored curriculum and policy systems, while library scholars drew inspiration from international cases to develop China-appropriate solutions. Overall, initial information literacy education emphasized skill training.

Stage 2 saw thematic integration. Document retrieval and IT curriculum planning merged into systematic information literacy education systems across levels, making research more systematic. Pedagogical model reform became central, with skill courses integrating into professional teaching systems. Scholars explored online information literacy education using Web 2.0 tools like blogs and wikis [?, ?], discussing universality and general education.

Stage 3 began at the 30th anniversary of document retrieval courses. With successful nationwide promotion, basic courses couldn’t meet complex information environment demands across disciplines. Embedding information literacy modules into disciplinary education became key. New teaching methods facilitated transformation, broadening target groups and increasing content flexibility. Education research emphasized identifying students’ core competencies and culti-

vating flexible problem-solving abilities [?]. The focus shifted from skill training to thinking and awareness.

Stage 4 continued these issues, absorbing new concepts like SPOC and AI-assisted teaching. Smart mobile devices and 4G+ mobile internet prompted concept system differentiation. After document retrieval and IT became basic skills, metaliteracy, data literacy, and AI literacy emerged, emphasizing interaction, adaptation, and learning in dynamic information environments. Metaliteracy's foundation in metacognition represents awareness rather than skill.

Thus, China's information literacy education evolved from capability cultivation to awareness education to meet new environmental demands.

3.3 Target Audiences Expanding from Students to the Public

Stage-by-stage analysis reveals gradual audience expansion with three characteristics:

1. **Extending educational levels:** Starting from higher education, Stage 1 extended to vocational and primary/secondary education, becoming priorities in Stage 2. Stage 3 saw formal promotion across all levels.
2. **Deepening with professional needs:** Early specialized education supported by single library science knowledge lacked professional relevance. From Stage 2, embedded disciplinary services, curriculum integration, and professional core competency identification became priorities.
3. **Breaking educational boundaries:** Student-focused clusters dominated Stages 1-2 but disappeared in Stage 3 as research shifted to information equity and public library services. Stage 4's popular health information literacy education for the public demonstrates thematic flexibility.

Overall, China's information literacy education developed batch-by-batch in schools before gradually serving the public and evolving into lifelong learning support services.

3.4 Continuously Deepening Recognition of Information Resource Attributes

Stage 1's document retrieval and IT courses covered information resource discovery, acquisition, and application. Sporadic education and government informatization research reflected auxiliary tool functions. From Stage 2, scholars emphasized information consumption behaviors in new media environments [?] and information accessibility/equity. Stage 3's "Internet Plus" concept clarified the internet as an economic driver, highlighting information and data resource attributes as production factors. In Stage 4's big data context, mature information consumption patterns and service industries deepened understanding of data elements, which will integrate into new-era information and data literacy

education. While data as a production factor receives widespread attention, exploration of its resource attributes, value attributes, and application scenarios continues. Future information literacy education may innovate further in these directions.

Conclusion

This study analyzed China's 30-year information literacy research evolution using logistic growth stage division and BERTopic modeling. Findings show: (1) University libraries as primary institutions maintain environmental sensitivity for continuous service innovation; (2) Education content shifted from early skill training to awareness cultivation, with audiences expanding from students to the public; (3) Societal recognition of information resources' resource and value attributes as production factors enhances information literacy education's universality, necessity, and applicability.

In the foreseeable future, specialized information literacy education may transition to flexible informal information awareness cultivation models. The new era's information resource management discipline will continue leading information literacy education direction, coordinating informal education resources, and evaluating information credibility and compliance, promoting synergistic development between information literacy research and environmental changes.

This study used open-source Chinese pre-trained datasets. Future improvements could involve expanding specialized lexicons for information resource management and education to enhance analytical accuracy and reduce redundancy.

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

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