Postprint: A Systematic Review of Research on Information Literacy Teaching Effectiveness Evaluation in Chinese Universities

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Abstract

[Purpose/Significance] This study analyzes the achievements, experiences, and shortcomings in the evaluation of information literacy teaching effectiveness in domestic universities, providing a reference for subsequent empirical research. [Method/Process] Based on the CNKI "China Academic Journals (Online Edition)" database and focusing on information literacy education and student learning outcomes, this study employs systematic review methods to investigate the evaluation methods, types, and subjects of domestic information literacy teaching effectiveness evaluation. [Results/Conclusion] Domestic information literacy teaching effectiveness evaluation has utilized various methods including surveys, scales, performance assessments, and group evaluations, achieving certain results. However, improvements are still needed in the scientific rigor of evaluation methods, diversification of evaluation types, and specialization of evaluation subjects.

Full Text

Preamble

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A Systematic Review of Research on the Assessment of Information Literacy Teaching Effectiveness in Chinese Universities

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Abstract

[**Purpose/Significance**] This study analyzes the achievements, experiences, and deficiencies in the assessment of information literacy teaching effectiveness in Chinese universities, providing a reference for subsequent empirical research. [**Method/Process**] Based on the CNKI China Academic Journal Network Publishing Database, this research focuses on information literacy education and student learning outcomes, employing systematic review methods to examine domestic assessment methods, types, and subjects in information literacy teaching evaluation. [**Results/Conclusions**] Domestic information literacy teaching effectiveness assessment has utilized various methods including surveys, scales, performance assessment, and group evaluation, achieving certain accomplishments. However, improvements are still needed in the scientific rigor of assessment methods, diversification of assessment types, and professionalization of assessment subjects.

Keywords: Information Literacy; Assessment; Systematic Review
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Introduction

In the 1990s, as educational assessment became a focal point in international higher education, the library and information science field began empirically evaluating student information literacy levels to demonstrate educational effectiveness and provide references for practice. After entering the 21st century, the volume of literature on information literacy assessment grew substantially, generating several review articles. Internationally, there have been both traditional reviews, such as J. Huford's review of user education in academic and research libraries from 2005 to 2011 [1], and more scientifically rigorous systematic reviews covering topics like health library information skills training effectiveness assessment [2] and comparative studies of face-to-face versus online information literacy education [3]. In 2018, A. Erlinger conducted a systematic review of 59 articles selected from 3,331 studies on library user education and face-to-face information literacy courses, identifying seven assessment methods: surveys, focus groups, objective tests, classroom/performance assessment, authentic assessment, scales, and standardized tests [4], providing an excellent reference for international information literacy assessment.

Domestically, Jiang Kui employed bibliometric methods in 2009 to conduct a statistical analysis of information literacy assessment research in China, covering evaluation standards and specific practices [5]. However, no systematic review has yet focused on information literacy education assessment concerning student learning outcomes. Building upon existing research [4-5], this study attempts to address this gap.

2. Research Methods and Process

2.1 Retrieval Strategy

Compared with traditional reviews, systematic reviews focus on specific questions with greater scientific rigor and objectivity, helping to define the boundaries of known and unknown knowledge and promote knowledge renewal [7]. Originating in the medical field, systematic reviews have now expanded to sociology, psychology, education, management, and other disciplines.

This study focuses on library user education, literature retrieval courses, and information literacy teaching effectiveness assessment. The research questions include: What are the theories and methods of information literacy teaching effectiveness assessment? Which assessment methods are actually used? What are the advantages and disadvantages of each method?

The CNKI China Academic Journal Network Publishing Database was selected as it indexes 68 library and information science journals, including 26 CSSCI (including extended) core journals, which basically meets data requirements. Using professional search methods, the literature classification directory was limited to "Library Science, Information Science, and Digital Libraries." The search formula was: SU=('information literacy'+'information quality'+'library user education'+'new student library orientation'+'digital literacy'+'literature retrieval course'+'information retrieval course'+'training'+'lecture') AND SU=('assessment'+'evaluation'+'measurement'+'survey'+'empirical'+'citation'+'teaching effectiveness'). This yielded 2,101 records, including 713 from CSSCI and core journals. The search was conducted on March 2, 2019. Relevant records were imported into Excel and E-Study for systematic review screening.

2.2 Systematic Review

Systematic review refers to the use of systematic methods to collect literature, critically evaluate it, and synthesize research findings [6]. Systematic reviews typically include five components: defining research questions, establishing inclusion and exclusion criteria to identify relevant materials, critically appraising included studies, extracting data, and synthesizing results.

The literature screening and evaluation process was conducted through joint discussion by the first two authors. First, relevant literature was selected by reading titles, keywords, and abstracts. Then, full-text reading was used to further delete less relevant literature and adjust literature classification. Finally, relevant records were supplemented. Detailed inclusion and exclusion criteria were as follows:

Inclusion Criteria: Research related to library user education, embedded information literacy, information literacy courses, assessment platforms, and assessment methods. Institution types included both regular four-year universities and vocational colleges. Research subjects included undergraduate students,

graduate students, doctoral students, and distance learners. Literature types included both theoretical and empirical studies.

Exclusion Criteria: Studies on non-university students (such as university faculty, primary/secondary school teachers, agricultural technicians); generic information literacy evaluation standard documents not oriented toward courses; literature whose main topic was not teaching assessment but rather surveys of information literacy levels across schools, regions, or inter-regional areas; literature with overly broad or vague assessment content; and literature introducing foreign experiences (such as SAILS and PIL projects).

3. Dimensions and Methods of Information Literacy Teaching Effectiveness Assessment

Domestic information literacy assessment research primarily involves evaluation indicator and system construction, large-scale student information literacy level surveys, international evaluation standards and related experience introduction, information literacy education models and their assessment, information literacy pedagogy and assessment, and information literacy assessment methods and course evaluation. After excluding irrelevant literature, a total of 248 articles were obtained, including 112 theoretical articles and 136 practical articles. The earliest publication date was 1995, with early literature focusing on literature retrieval course effectiveness assessment [8-9] and small publication volumes. After 2004, the number of articles began to increase substantially, adding content on information literacy assessment [10-11]. As the information environment became increasingly complex, assessments of online courses, MOOCs, embedded courses, and blended courses emerged alongside traditional new student orientation, training lectures, and course evaluations. Specialized information literacy assessment platforms appeared [12], and empirical research on the relationship between information literacy and student success was conducted [11]. Over more than 20 years, multiple assessment dimensions and methods have developed.

From the temporal dimension, domestic information literacy teaching effectiveness assessment can be divided into placement (before instruction), formative (during instruction), diagnostic (during instruction), and summative (after instruction) assessment, with case examples in literature [13-14]. From the hierarchical analysis perspective, we can draw on the classic corporate performance evaluation theory—Kirkpatrick's Four-Level Evaluation Model. Developed in the mid-20th century and gradually revised and improved, this model divides assessment into four levels: reaction, learning, behavior, and results [15]. The reaction level focuses on learners' emotions, attitudes, and perceptions, primarily measuring satisfaction and perceived effectiveness through satisfaction surveys and questioning. The learning level concerns the degree of knowledge and skill mastery, often using tests or performance assessment in controlled simulated situations, limited to educational contexts. The behavior level breaks through the educational context, referring to behavioral changes caused by applying learned knowledge and skills in practice. The results level focuses on the long-term im-

pact of education on actual work and life, which is difficult to implement and rarely applied in foreign information literacy education [4].

In the more than 20 years of domestic information literacy education assessment development, various methods have been employed including examinations, questionnaires, scales, interviews, citation analysis, comprehensive reports, and focus groups (see Table 1), along with various analytical approaches such as hierarchical analysis, fuzzy comprehensive evaluation, network analysis, and multi-objective decision-making. Theoretical literature specifically studying assessment methods has also emerged [16-18]. Referring to Kirkpatrick's Four-Level Evaluation Model, domestic assessment is mainly limited to the reaction, learning, and behavior levels. Compared with foreign research findings [4,19-20], domestic research emphasizes constructing evaluation standards, indicator systems, and methods. From a temporal perspective, early research mainly used questionnaires for course evaluation and examinations for grade determination. Except for a few studies [21], there was a lack of scientific method application and reflection on the advantages and disadvantages of assessment methods. In recent years, assessment methods have become increasingly diversified and scientific [22-23].

Table 1 Overview of Methods Used in Practical Literature on Information Literacy Teaching Effectiveness Assessment

Method	Quantity (articles)	Proportion (%)	Proportion in A. Erlinger [4] (%)
Performance Assessment	53	39%	-
Comprehensive Report	45	33%	-
Citation Analysis	41	30%	-
Authentic Assessment	-	-	-

3.1 Questionnaire Survey

Questionnaire surveys have the highest usage rate (56%), further confirming that they are the most widely used classic survey method in domestic empirical research (as Xu Jianhua noted [27]) and in information literacy assessment research [5]. Survey areas mainly include new student library orientation and information literacy education courses, with fewer evaluation studies on one-time or series lectures, such as in literature [28-29]. Survey content varies in depth and length. Some studies construct comprehensive questionnaires based on domestic and international information literacy evaluation standards and indicator systems, measuring information awareness and emotion, information ethics, information knowledge, and information ability [30-31] (few such articles due to inclusion criteria limitations). However, most surveys focus on teaching content, investigating dimensions such as student-perceived teaching attitudes, content, methods, effectiveness, satisfaction, and course feedback. Pre-post questionnaire comparisons and comparative studies of different educational methods

help highlight educational effectiveness [32]. More successful questionnaire studies combine scales, such as Liao Minxiu's use of the ARCS motivation model for student self-assessment questionnaires to investigate the impact of different teaching methods on learning motivation through comparison with general teaching methods [33].

The advantages of questionnaire surveys lie in their convenience and ease of use, especially electronic questionnaires, which are easy to modify, manage, and statistically analyze, with low costs and broad applicability. They are suitable for measuring affective and reaction levels in the learning domain rather than behavioral or cognitive levels [4], making them appropriate for pre-course surveys of student-perceived information literacy levels and post-course satisfaction analysis. Their disadvantages include primarily measuring student-perceived levels and effects, with strong subjectivity. Students tend to overestimate their learning levels and guess the surveyor's intentions, resulting in superficial findings that cannot effectively evaluate student learning degrees and behavioral performance.

Good questionnaire design requires substantial time and effort. In early information literacy teaching effectiveness questionnaires, applications were subjective and superficial, with simple and casual usage, mostly limited to descriptive statistics, lacking pre-testing and reliability/validity testing. Research design, sample selection, and data analysis need strengthening. In recent years, improvements have been made, with questionnaire design and analysis becoming increasingly scientific and beginning to incorporate scales.

3.2 Scale

Scale-based literature has mainly been published after 2010, with only 18 articles accounting for 13%, showing a significant gap compared with data from A. Erlinger [4]. Compared with pure questionnaire literature, scale-based literature demonstrates more scientific and standardized research design and data analysis methods. However, there is also conceptual confusion and unclear boundaries, with some researchers treating scales or tests as questionnaire surveys. For effective analysis, this study defines questionnaires as a series of questions designed by researchers to collect information about respondents' attitudes, values, opinions, or beliefs regarding a specific issue [24], primarily measuring the reaction level in Kirkpatrick's model.

Scales refer to the use of symbolic or numerical rating indicators to measure assessment content. They are convenient and user-friendly tools often used in questionnaires or performance assessments. Compared with questionnaires, scales emphasize theoretical frameworks and measurement precision. Good scale design and content can reflect teachers' educational expectations and goals, benefiting both teachers and students. For teachers, the scale creation process facilitates discussion and clarification of student learning values and goals. Since scale data is detailed and scores are measured consistently with high reliability,

they are useful. For students, scales provide high-quality evaluation criteria that help understand teachers', peers', and even experts' perspectives and expectations. Scales emphasize understanding rather than memorization, thus promoting effective learning. However, creating good scales is time-consuming and requires professional training [37]. Compared with this goal, domestic information literacy teaching effectiveness evaluation scales still have a long way to go.

3.3 Objective Examination

Examinations are one of the main methods for undergraduate information literacy assessment [38]. The main model for undergraduate information literacy education is classroom teaching + hands-on practice + regular assignments + attendance + examination. Due to their common nature, the proportion in academic literature is not as high as the actual proportion, accounting for about 43%, and most literature combines examinations with other methods.

Examinations are divided into open-book and closed-book tests, mostly open-book [38]. By medium, they can be paper-based or computer-based. Computer-based examinations offer relative flexibility, including establishing question banks, developing assessment platforms, and randomly selecting questions from the bank according to corresponding difficulty and test indicators [12,39], or using online examination systems [40].

Examinations can be used for both formative assessment to evaluate student knowledge during the learning process [41] and summative assessment for final testing [42]. Assessment scope includes both courses and new student orientation [43]. Compared with foreign research findings, domestic examination assessment is mainly limited to specific courses, lacking standardized tests that can be applied across multiple schools after rigorous design. In examination design, there is considerable randomness and lack of rigorous design and scientific data analysis, with only a few studies conducting further data analysis. Among them, literature [26] employed a rigorous pre-testing method; literature [44] analyzed test reliability, validity, discrimination, and correlation validity; literature [41] used P-value testing, independent sample T-tests, and grade frequency descriptions to further analyze test and question difficulty and grade distribution.

The examination method has a long history and certain advantages: First, for instructors, examination design, scoring, and statistics are relatively simple. Second, for students accustomed to examinations, scores are documented, reducing suspicion about grade fairness, thus attaching importance to examination results. Third, reliability can be effectively increased through pre-post testing and increasing test length.

However, in the context of examination-oriented education, examinations also have shortcomings: First, in terms of measurement content, examinations mainly divide teaching objectives into smaller knowledge points, testing

students' recognition ability rather than recall ability (for example, 80% of freshmen can identify correct answers based on common sense [26]), making it difficult to measure "how-to" knowledge or higher-order thinking skills such as analysis, synthesis, and evaluation. They cannot measure students' actual operational processes and skills, thus often failing to measure effective teaching. Second, examination scores often affect teacher reputation, student scholarships, and further education, leading students to use examination standards as learning value standards, studying for scores while neglecting the cultivation of practical academic, life, and work-related abilities.

3.4 Performance Assessment

Performance assessment mainly measures student performance in simulated or real situations, observing both the practice process and results. Domestic application methods mainly include comprehensive reports, exercises, and citation analysis.

Comprehensive reports generally include topic selection, literature retrieval tools, strategies and processes, and review writing (topic background, current status, problems, trends, research discussion). Formats include writing retrieval reports, review reports, or creating PowerPoint presentations. Comprehensive reports help examine students' ability to use information to solve problems, promote learning application, and collaboration with subject faculty enhances report effectiveness.

Forty-five articles used comprehensive reports, accounting for 33%. In 1998, Huang Mengli used this method to examine student literature retrieval ability [45]; in 2016, Hua Fang designed a report template from five aspects—topic selection, data searching, management, utilization, and self-evaluation of learning effects—to examine student performance in retrieval, analysis, reasoning, and evaluation [46], providing good references for future report-based assessment.

Comprehensive reports also have limitations: teaching assessment is limited by the instructor's professional competence; large-scale general education courses have too many students for teachers to effectively implement; there are plagiarism issues; and teacher subjectivity is strong. To overcome the drawbacks of single-assessment models, literature [47] reformed assessment methods by adopting a three-element assessment method of "regular grades + theoretical examination + internship report," achieving better results.

Citation analysis can be combined with reports for assessment. For example, literature [48] set six indicators to evaluate research reports, with citation-related indicators including whether reference sources are professional and whether cited data are accurate, reasonable, and comprehensive; other indicators include whether arguments are accurate and appropriate, whether structure is reasonable with key points highlighted, whether classroom discussion is active, and whether problem statements are appropriate, providing references for effective citation-related evaluation. Citation quantity and standardization can reflect

academic normative development to some extent. In 1998, Huang Lijuan compared citation patterns in graduation theses between Department A (without literature retrieval courses) and Department B (with courses) at Hunan Normal University, finding that only 48% of Department A's theses had citations with an average of 0.5 citations, while Department B had about 86% with an average of 6.0 citations [49]. In recent years, citation evaluation has focused not only on literature quantity and timing [50] but also on applying citation methods to literature retrieval, evaluating citation standardization (according to GB/T 7714-2005) and reference journal sources (whether indexed in Web of Science or top JCR journals) [51].

Classroom exercises are commonly used teaching and assessment methods in daily information literacy instruction, but few articles discuss them in detail. Effective exercises should establish certain teaching situations, use case teaching, and allow students to conduct research practice [13]; they can also set various scenarios based on societal expectations for education and work requirements, building practical retrieval question banks for civil servants, teachers, professional technicians, company staff, graduate school candidates, and entrepreneurs [52] to examine student information retrieval and evaluation abilities. Classroom exercises can be combined with post-class reflection assignments, requiring learners to complete corresponding reflection tasks after each topic to cultivate metacognitive ability [53]. Beyond scattered exercises, regular practice systems can be established to review theoretical knowledge and practice retrieval skills [39]; group cooperation can also be used for evaluation.

Performance assessment helps overcome the subjectivity of questionnaires and the limitations of knowledge measurement in examinations, facilitating observation of student practice processes in real or simulated complex and ambiguous situations or measuring student behavior through task outcomes. Performance assessment can measure higher-order thinking skills, with assessment methods and content closely linked to educational goals. Since assessment occurs in certain contexts, it helps ensure reliability and validity and promotes knowledge transfer [52]. However, performance assessment implementation is time-consuming and labor-intensive, posing difficulties with large class sizes.

3.5 Group Evaluation

Twenty-six articles used group evaluation, accounting for 19%. There are two approaches: one is group cooperative learning with evaluation; the other is specially organized group evaluation of learning effects. The domestic application mainly uses the former approach, such as Guangzhou Medical University organizing students into groups to design their own project topics using 15 sets of situational materials, with intra-group and inter-group scoring [54]. Group formation is an important part of group learning and evaluation, with 4-6 members being most appropriate [55]. Group evaluation helps collect descriptive data from multiple students simultaneously, but requires teachers to design structured questions in advance, and synthesizing and coding collected data

is time-consuming. Additionally, "free-riding" by students should be avoided when using group evaluation.

4. Research Findings and Discussion

Since Sun Jiqing published "Summary of Chemistry and Chemical Engineering Literature Retrieval Course Evaluation" in 1995, research on information literacy teaching effectiveness assessment has spanned more than 20 years. Assessment methods have evolved from early questionnaires and examinations to scales, performance assessment, and various other methods, becoming increasingly scientific, though deficiencies remain. Future practice should select appropriate methods based on current research limitations and the advantages and disadvantages of various assessment methods. Additionally, diversification of assessment types and standardization of assessment subjects should be strengthened to promote the development of assessment theory and practice.

4.1 Diversification of Assessment Types

Currently, domestic information literacy education mainly includes new student library orientation, information retrieval courses, embedded courses, blended courses, and training lectures. Assessment practice is primarily limited to the first few items, with few evaluation studies on one-time lectures, despite their being the main form of user education in most libraries.

4.1.1 New Student Library Orientation

New student orientation is a common educational method in most libraries, with eight articles evaluating its effectiveness. Assessment dimensions include students' awareness of library layout, resources, and borrowing rules, as well as satisfaction with orientation methods and training effectiveness. Assessment methods mainly use questionnaire surveys (7 articles), supplemented by computer tests (3 articles). Jiangsu University, Jinan University, Shaanxi Normal University, and Shanghai University have developed new student orientation systems and platforms, improving assessment efficiency and library service levels [56]. Future orientation assessment should expand platform development and application, using scales, tests, performance assessment, and other methods for comprehensive evaluation. Assessment timing could be extended to six months or one year after training, and evaluation levels should shift from reaction and learning to behavior.

4.1.2 Course Assessment

Course assessment is an important component of domestic information literacy teaching effectiveness evaluation. Course names include literature retrieval, information retrieval, and information literacy education. Course types include credit and non-credit courses, required and elective courses, face-to-face courses, online courses, and blended courses. Assessment research mainly includes status surveys, models, methods, reviews, teaching effectiveness studies, and course evaluation indicator system construction. Assessment dimensions include teach-

ing quality (content, design, organization, teacher attitude and competence), student learning needs and reactions (tests, questionnaires, reports, citations), and teaching environment (staffing, environment, and equipment). Assessment subjects include administrators, teacher peers, and students. Besides course instructors or collaborative teachers, university academic affairs offices or graduate school course evaluation systems are also important components of information literacy education assessment, though cross-campus peer or expert collaboration is lacking.

In course assessment, diversified methods have been used, accumulating rich experience. However, current course assessment is mainly limited to Kirkpatrick's reaction, learning, and behavior levels, with few long-term evaluation studies at the results level. Long-term evaluation requires teacher commitment, institutional cooperation from school management, and communication with employers, making implementation difficult. While long-term evaluation of information literacy education has been conducted abroad, domestic practice remains to be developed.

4.1.3 Library Lecture Assessment

For one-time library user education lecture effectiveness assessment, literature [28] established a library user education assessment model based on Altmetrics and analyzed ten lectures from perspectives such as WeChat platform notification reading volume, likes, training attendance, and courseware downloads. Literature [57] designed questionnaires and scales to conduct a beneficial trial of Peking University Library's one-hour lectures. Related research helps evaluate user education effectiveness, but the assessment subjects are not trainers, and assessment content remains superficial without focusing on student learning outcomes during the learning process.

One-time lectures are the main training method in most libraries. Due to time constraints, lecture content often focuses on specific databases or tools, easily neglecting the cultivation of critical thinking concepts and information literacy threshold concepts. Therefore, trainers should make full use of pre-post tests or questionnaires, one-minute papers, or confusion surveys, flexibly using technologies such as Rain Classroom, Wenjuanxing, Fanqie Form, or YiqiXie to strengthen student learning effect assessment and promote improvement. Additionally, training design should develop series content to attract long-term student participation and conduct long-term tracking to evaluate training effectiveness.

4.2 Professionalization of Assessment Subjects

Currently, domestic information literacy education assessment research mainly focuses on establishing evaluation indicator systems and large-scale or broad information literacy level surveys. Although assessment practice has begun, assessment subjects are mostly librarians and collaborative faculty engaged in related education, without dedicated full-time assessment librarians. Full-time

assessment librarians specialize in and independently organize and implement assessment activities, reporting results directly to library directors. Full-time assessment librarians emerged as a specialized position in the United States after 2000 [58], requiring formal assessment theoretical knowledge, teaching and presentation skills, collaboration skills, leadership skills, and the ability to lead teams in assessing user behavior and needs, analyzing and reporting assessment data. In January 2017, the Association of College and Research Libraries (ACRL) adopted the "Proficiencies for Assessment Librarians and Coordinators" [59], including 11 competency areas and 52 specific indicators covering assessment knowledge, ethics, methods and strategies, research design, data collection and analysis, communication and reporting, promotion and marketing, collaboration, leadership, management, and training skills, providing an excellent reference for China. Excellent assessment experts possess rich assessment knowledge, can scientifically train collaborators, ensure assessment reliability and validity, and improve student information literacy levels through assessment. The professionalization of assessment subjects should be an important direction for domestic information literacy teaching effectiveness assessment.

Information literacy teaching effectiveness assessment is an important part of library outcome assessment. It demonstrates the relationship between student academic achievement and the library and has increasingly attracted attention from foreign libraries, such as the "Assessment in Action" project conducted by North American libraries from 2012-2016, and promoting assessment implementation through institutional documents like the "Proficiencies for Assessment Librarians and Coordinators." Although China has conducted rich educational practices including new student orientation, face-to-face courses, MOOCs, and blended courses, using various methods such as questionnaires, scales, and performance assessment, deficiencies remain in assessment methods, types, and subjects. In the future, China should achieve institutionalization, scientific rigor, diversification, and professionalization of assessment through multi-party cooperation among government departments, library professional associations, higher education societies, universities, libraries, information literacy instructors, collaborative faculty, students, and third-party evaluation organizations, further shifting information literacy education assessment research from grand narratives to precise, in-depth, and scientific concrete practice.

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Author Contributions:

Peng Liwei: Conceptualization, data collection, analysis, and manuscript writing
Li Lei: Participation in systematic review process
Pan Hong: Review and revision of manuscript

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