

Implementing Guided Inquiry Design in College Information Literacy Instruction: A Case Study of Shanghai University of Finance and Economics Library (Postprint)

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Date: 2023-08-26T00:00:00+00:00

Abstract

[Purpose/Significance] The challenge of implementing information literacy instruction through credit-bearing courses lies in how to stimulate and sustain students' learning interest over a relatively extended period, deliver course content and skills, and transfer the learning outcomes to disciplinary learning processes. This article primarily examines the role and limitations of guided inquiry in meeting this challenge.

[Method/Process] Guided inquiry, instructional scaffolding, and group learning constitute the key elements in designing guided inquiry-based information literacy instruction. Through case study analysis, this paper presents the process of introducing guided inquiry design in the implementation of undergraduate information literacy credit-bearing courses.

[Results/Conclusion] Employing guided inquiry to design information literacy credit-bearing courses provides more opportunities for close observation of students and fosters their collaborative learning abilities; however, guided inquiry requires teachers to design instructional scaffolding, observe and diagnose learning performance, and iteratively improve instructional design, while also presenting limitations such as the absence of teachers' disciplinary perspective and difficulties in evaluating the efficiency of knowledge transfer.

Full Text

Preamble

Vol. 62 No. 10, May 2018

Using Guided Inquiry Design to Implement an Information Literacy Course for University Students—A Case Study of Shanghai University of Finance and

Economics Library

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Abstract

[Purpose/Significance] The challenge of delivering information literacy instruction through a credit-bearing course lies in how to stimulate and sustain student interest over a relatively long period, impart course content and skills, and transfer learning outcomes to disciplinary study contexts. This paper discusses the roles and limitations of guided inquiry in addressing this challenge. **[Method/Process]** Guided inquiry, instructional scaffolding, and team-based learning are key concepts for designing an inquiry-based information literacy course. This paper introduces the process of implementing a credit-bearing undergraduate information literacy course using guided inquiry design through case analysis. **[Result/Conclusion]** Designing an information literacy credit course using guided inquiry provides more opportunities for close observation of students and cultivates their collaborative learning abilities. Guided inquiry requires teachers to design scaffolding, observe and diagnose learning performance, and iteratively improve instructional design. However, it also has limitations such as the absence of teachers' subject perspectives and difficulties in evaluating the efficiency of knowledge transfer.

Classification Number: G251

Keywords: scaffolding; inquiry-based learning; guided inquiry; information literacy

2 Key Concepts

Three important concepts—guided inquiry, scaffolding, and team-based learning—are crucial for understanding the information literacy course design discussed in this study.

2.1 Guided Inquiry

Guided inquiry is a concept developed from constructivist pedagogy. For information literacy education, guided inquiry is a teaching method led by an instructional team that enables students to gain in-depth understanding and personal perspectives through utilizing multiple information sources [5]. It is process-oriented, requiring the integration of information literacy concepts into the inquiry process [6].

The information search process model provides a theoretical background for understanding guided inquiry. From a constructivist perspective, the information search process is a knowledge construction process—a model of knowledge construction across affective, cognitive, and physical dimensions, comprising six

stages: initiation, selection, exploration, formulation, collection, and presentation (see Figure 1 [Figure 1: see original paper]). This model serves as both a framework for understanding people's information-seeking experiences in library environments and a diagnostic tool [7]. It also provides a theoretical instrument for librarians and subject teachers to collaborate on inquiry-based learning with disciplinary themes. Implementing guided inquiry in information literacy instruction is based on such conceptual, process-oriented information behavior models. Under given tasks, it guides students to use open-ended strategies and methods to obtain valuable information.

The information search process model and guided inquiry aim to meet students' information needs and have served as reference models for student-centered information literacy instruction in American schools for nearly 20 years [8]. Guided inquiry is student-centered, grounded in authentic contexts, conducted in small groups, and culminates in final products shared with others. The instructional team, typically composed of teachers, librarians, and other domain experts, acts as facilitators who intervene in inquiry learning activities, design and provide learning environments, and promote autonomous learning. In short, guided inquiry can be understood as planned, goal-oriented, and monitored intervention in the inquiry process [9].

2.2 Scaffolding

Instructional scaffolding, or simply “scaffolding,” was first proposed by D. Wood, J.S. Bruner, and G. Ross [13], originally referring to “the immediate support provided by teachers or parents (tutors) to learners that enables meaningful participation in problem-solving and skill acquisition.” Scaffolding has now become a mature instructional theory and strategy based on Vygotsky's zone of proximal development theory—connecting students' prior knowledge with new knowledge to develop higher-order thinking.

Inquiry-based learning requires extensive scaffolding [2], as most students need assistance from experienced individuals before they can effectively engage in active learning [3]. Without scaffolding, students often simply collect information and complete assignments through “copy-paste.” With guidance, students can focus on constructing new knowledge, gaining personal understanding, and transferable skills during the inquiry phase [9].

Scaffolding reduces cognitive load, allowing students to learn in complex domains [2]. The ultimate goal of scaffolding is “fading”—when learners' prior knowledge becomes sufficient to provide “internal” guidance, the scaffolding can be removed. This fading function effectively promotes the formation and development of autonomous learning abilities [14].

Using scaffolding in learning activities can enhance motivation and deepen resource utilization. Scaffolding promotes learning activities by increasing the value of learning tasks and boosting interest and motivation [15]. Teachers who provide scaffolding rather than definitive answers help students grow into prob-

lem solvers. Teachers with high scaffolding design ability can better leverage learning materials and teaching resources [14].

Scaffolding design encompasses a wide range of elements: content, methods, strategies, timing, and contexts. Teachers provide structure and guidance through training, task structuring, prompts [16], learning materials, teacher and peer support [17], and computer-based scaffolding. Worked examples based on cognitive load theory [18] are a common type of scaffolding. C.C. Kuhlthau's six guided inquiry tools for addressing information search difficulties—such as learning logs, records, and tools [5]—also exemplify scaffolding. This study focuses on teacher-provided rather than computer-based scaffolding.

2.3 Team-Based Learning

Team-based learning is a fundamental characteristic of inquiry-based learning and an important organizational form of peer scaffolding (peer support). It has four key elements: team formation and management, accountability, feedback, and assignment design [19].

- (1) **Team Formation and Management.** Teachers establish rules to ensure teams have adequate resources and are roughly equivalent in size and capability. Team formation should avoid alliances that affect cohesion and promote development into genuine learning teams [20].
- (2) **Accountability.** Students must be responsible for the quality of individual and team activities. Full participation from every member—from regular attendance to group discussions to problem-solving—is prerequisite for successful task completion.
- (3) **Feedback.** Students must receive frequent, timely feedback. Timely teacher feedback is necessary for content learning and retention and significantly impacts team development.
- (4) **Assignment Design.** Team assignments must simultaneously promote inquiry-based learning and develop team members' learning abilities.

The educational goals of inquiry-based learning include not only content knowledge and cognitive practice but also soft skills like collaboration and autonomous learning [2,21]. Team-based learning cultivates social skills through interaction, collaboration, and cooperation—essential learning activities in guided inquiry. Peer scaffolding plays a positive role here. Due to ability differences among students, discussions can promote each other's development of higher-order thinking. In guided inquiry team learning, each member can find value in tasks such as finding terminology, evaluating information sources, summarizing information, asking questions, connecting learning experiences, note-taking, creating visual frameworks, and interpretation [9].

2.4 Feasibility of Combining Teaching Strategies

Guided inquiry addresses the information search process, while information literacy credit courses cover the entire research process: from question formulation and needs identification to information location and retrieval, evaluation, and ethical use. Content differences lead to varying degrees of student independence and teacher intervention. For example, information retrieval focusing on process is more suitable for guided inquiry than information ethics focusing on concepts.

Notably, guided inquiry was proposed in the context of collaboration between school librarians and subject teachers, making it inherently embedded in disciplinary instruction from the design stage. Applying it to library-led information literacy credit courses may have limitations. However, knowledge learning is itself a process of information acquisition and utilization. From this perspective, we can reinterpret the possible forms and significance of guided inquiry in information literacy credit courses from a research process perspective.

Figure 2 [Figure 2: see original paper] reveals the conceptual relationship among guided inquiry, scaffolding, and team-based learning. Using guided inquiry to design information literacy instruction means organizing content and activities based on understanding the information search process model. Scaffolding provides a continuously evolving, flexible “toolbox” of strategies. Team-based learning is both a main feature of inquiry-based learning and a form of peer scaffolding, providing formal peer interaction beyond teacher-student engagement.

In summary, guided inquiry provides the theoretical foundation and methodology for understanding and organizing information literacy instruction. Scaffolding and team-based learning, as specific strategies and organizational forms, provide the basis for designing and organizing teaching activities and tools to achieve instructional goals. Designing an information literacy credit course represents a comprehensive application of these three important pedagogical concepts and strategies.

3 Case Study

In late 2014, Shanghai University of Finance and Economics Library applied to offer a credit-bearing general education course for undergraduates titled “Information Literacy and Knowledge Discovery” (2 credits, 32 class hours). Referencing higher education information literacy standards and focusing on the research process, the course aimed to cultivate undergraduates’ ability to effectively use information sources to solve research problems in an Internet environment. The teaching team consisted of four reference librarians who communicated and improved instructional design through regular teaching meetings. Since its launch in September 2015, the course has been offered for five semesters with over 500 undergraduate enrollees (including approximately 70 international students). Class sizes ranged from 43 to 147 students, all from different majors and grade levels across the university. The course used a team teaching approach, with each librarian responsible for different themes. Instructional content referenced

multiple information literacy education standards, combined with classroom observations and student feedback, and was finalized through repeated discussions and revisions.

3.1 Teaching Framework

The course was positioned for undergraduate general education within the university's general curriculum system under the "Social Analysis and Civic Literacy" module. It was the library's first credit course on information literacy following traditional literature retrieval courses.

Content Preparation: Since 2012, the library had regularly held lecture series on literature research methods for faculty and students, exploring content innovation around the research and writing process, including topics such as topic selection, finding business papers, industry and market information, company information, staying updated, knowledge management tools, research evaluation tools, academic ethics and citation standards, and literature review writing. These efforts accumulated teaching experience for the credit course. However, the challenge was that credit course students were primarily undergraduates with limited research experience, unlike the previous audience of faculty and graduate students, requiring greater attention to content difficulty and coherence.

Strategy Preparation: Librarians faced the challenge of maintaining student interest from diverse majors and grade levels over a relatively long learning cycle. First, they needed to introduce content relevant to common professional learning needs. More importantly, while librarians were familiar with information literacy content, they lacked professional backgrounds in students' disciplines, making it difficult to balance assessing information literacy learning versus professional knowledge application.

The final teaching framework reflected both content and strategy considerations:

3.1.1 Content Design

- (1) **Organizing Content Around the Research Process:** Implementing educational goals of general academic and information literacy, helping students understand the research process from an information utilization perspective, including stages, thinking abilities, and skills, and systematically training students to develop basic competencies for using information in learning and research.
- (2) **Incorporating Professionally Relevant or Common Topics:** Implementing differentiated classroom education that accommodates differences in research experience and abilities among students from various majors and grades by selecting topics with professional relevance or common interest to organize teaching resources and guide inquiry-based learning.

- (3) **Expanding the Understanding of Tools:** Unlike traditional literature retrieval courses that focused on mastering library-subscribed economic literature tools, information literacy instruction looks beyond library databases to the broader Internet information environment, especially the evolving academic information landscape. The concept of tools extends from literature retrieval tools to various tools supporting social and collaborative research processes.
- (4) **Designing Various Scaffolds to Actively Intervene in Learning:** Scaffolds guide students through inquiry tasks and support repeated use, providing necessary tools for autonomous learning. These include courseware, assignments, team learning activities, and examples. As diagnostic tools, they help teachers understand learning dynamics, identify problems, and provide timely guidance and correction.
- (5) **Adopting Team Learning to Build Peer Scaffolding:** Teams are formed at the beginning of the course, with team discussions, assignments, and presentations organizing learning activities. Students are also encouraged to share learning experiences and problems based on their characteristics.
- (6) **Focusing on Learning Feedback and Systematically Evaluating Course Effectiveness:** Formative assessment is introduced, using in-class exercises, assignments, and final exams to continuously collect teaching needs and learning feedback. The teaching team also uses teaching logs to document processes, reflect on problems, and iteratively improve instruction.

3.1.2 Teaching Strategy Selection

- (1) **Selectively Introducing Inquiry-Based Teaching:** Appropriate methods are chosen based on content and context. Important concepts are still taught primarily through instructor lectures with courseware, while guided inquiry is integrated through various scaffolding forms.
- (2) **Introducing Outcome-Based Teaching:** Clearly defining specific learning objectives and expected outcomes linked to assessment [23].
- (3) **Using Authentic Context Teaching:** Content and tasks are designed around the research process, presenting real contexts without providing definitive standard answers, and connecting learning tasks to students' authentic learning experiences to train critical understanding of the evolving information environment.

3.2 Instructional Design

3.2.1 Teaching Themes and Schedule The course runs approximately 15 weeks, covering 11 themes including topic selection, needs identification, information retrieval and management, information evaluation, citation standards,

and media literacy. Over half the teaching time (8-10 weeks) helps students identify topics, understand and select retrieval tools, and begin searching for, retrieving, and evaluating relevant literature. During this period, team discussions, assignments, and presentations are integrated with lectures. Topics like media literacy, information evaluation, review writing, and citation standards use in-class exercises (surveys), examples, and assignments to deepen understanding and practice. See Figure 3 [Figure 3: see original paper] for an overview.

3.2.2 Assignment Design Students complete three assignments through individual and team learning: (1) an Internet resource survey report at the beginning of the semester; (2) a literature research report mid-semester; and (3) a literature review at the end of the semester.

The Internet resource survey report uses an analytical framework from the course section on “scientifically evaluating Internet information.” Since students have just started the course and mostly lack systematic analytical frameworks, they complete the assignment based on personal experience and judgment. The design aims to: (1) understand students’ actual situations, and (2) create baseline records for comparison after learning about information evaluation, promoting autonomous learning.

The literature research report design originates from the “pre-search” concept. The first four stages of the information search process model relate to pre-search, which is a repeated, gradually focusing process. The exploration stage is particularly difficult for students, often causing emotional dips (e.g., lack of confidence, frustration, doubt). The core content of the literature research report helps students follow given step-by-step prompts and examples, select appropriate tools for their learning tasks, begin pre-searching, and record search terms, strategies, and result quantities while making basic relevance judgments (e.g., “high reference value, can be used as evidence,” “background information, needs further narrowing,” “needs additional limiters”). Students must also explain reasons for choosing among overlapping results from different tools and reflect on problems encountered during topic determination and searching. This assignment also assesses mastery of literature management tools. Recording the pre-search process serves the same learning support function as learning logs in inquiry-based learning.

The literature review is submitted at the end of the semester after completing all course content, requiring students to synthesize previously collected literature around their research topics. The assignment template clearly defines requirements: format includes title, abstract, keywords, body, and references (5 sections); 3-5 paragraphs; content must clarify background information, research status, contributions to their own research, and problems and limitations of related research.

As shown in Table 1, each assignment template has clear task requirements,

specific step-by-step instructions, and complete prompts. Design ensures internal consistency and coherence among requirements, instructions, and prompts to avoid student confusion.

Table 1 Learning Activities and Teaching Purposes Related to Assignments

Assignment	Learning Activities	Teaching Purpose
Internet Resource Survey	Students select an Internet resource based on experience, analyze usage rationale considering information needs, resource surveyed, acquisition cost, content storage/utilization, producer, quality, and position, plus team tasks	Assess actual status of students' information resource evaluation at course beginning
Literature Research Report	Determine research direction, information needs, keywords, search strategies; select information sources; search for relevant information; record and evaluate retrieval process	Document learning process; assess practical operation and mastery of key steps from topic selection to literature acquisition
Literature Review	Formulate specific research questions and synthesize viewpoints	Assess comprehension and practical application of academic citation standards and ability to synthesize and express viewpoints

Examples are used in lectures, assignment guidance, and final exam practical questions to reduce cognitive load. They convey highly generalized content through decomposition or complete presentation, teaching key knowledge points or recreating assignment contexts to answer questions, thereby promoting serious participation and controlling assignment quality.

3.2.3 Peer Learning Scaffolding Team learning runs throughout the course. After determining team size (4-8 members) and number (7-18 teams per class), teams complete tasks including topic selection, individual and team literature research reports, presentation of results and problems, regular discussions, and individual literature reviews. The team leader coordinates and presents, while other members independently undertake information collection, evaluation, synthesis, and interpretation based on division of labor. Individual and team literature research reports are completed by members and leaders respectively, with leaders additionally responsible for summarizing

team retrieval tasks. Literature reviews are completed independently by all members.

Team learning scaffolds include team discussion minutes, assignment templates, and related courseware for recording key discussion conclusions and guiding extracurricular inquiry activities.

Additionally, class time is provided for learning tool sharing, where students can recommend their tool experiences before formal classes begin (1-2 students per session, within 10 minutes).

3.2.4 “Guide-Intervene-Feedback” Mechanism Teaching activities follow the principle of “classroom guidance, scaffolding intervention, and process feedback.” To ensure systematic and coherent content, each class session is structured as: review (5-10 minutes), content delivery (25-35 minutes), and feedback interaction (5-10 minutes). The review stage uses concept maps and tables to summarize previous key points and address after-class questions. Content delivery uses PowerPoint, teacher demonstrations, student demonstrations, and videos. After main content delivery, 5-10 in-class exercises assess mastery or discussion questions are arranged for team discussions with immediate feedback to deepen learning.

Scaffolding intervention occurs both in and out of class, primarily through: (1) assignment design guiding autonomous task completion; (2) WeChat groups for online Q&A; and (3) in-class examples and step-by-step explanations.

Teaching feedback is obtained through questionnaires, discussion minutes, assignments, classroom and after-class observations, and post-course interviews with representative students. Pre- and post-course surveys using the same instrument assess changes in information literacy awareness and self-assessed competence. Additional surveys assess specific content needs. The course WeChat group facilitates timely communication and feedback between librarians and students, and among students.

3.3 Teaching Process

As a newly offered information literacy credit course, it has undergone 2.5 years of teaching practice with multiple iterations of content and strategies based on feedback. The implementation is described from three aspects: content delivery, teaching activity organization, and feedback.

3.3.1 Content Delivery Before the course, the teaching team referenced *100% Information Literacy Success* [24] and open online resources to revise the syllabus repeatedly, developing lecture notes, assignment templates, examples, in-class exercises, and a course learning resource navigation [25] for all 11 themes, shared with students via Blackboard. Major revisions included eliminating a separate lecture on “Research Process and Big6 Information Problem-Solving Strategies,” instead integrating Big6 throughout the course.

Content focuses on research awareness, critical thinking, and core information skills necessary for the research process. The first six lectures aim to equip students with necessary topic selection criteria, methods, thinking tools, and knowledge and skills for retrieving and managing academic literature (primarily research papers), and to identify appropriate team research questions to facilitate team learning. Literature management tool instruction covers both the library-subscribed NoteExpress and open-source Zotero to accommodate Windows and Mac environments. Factual data is a common information type for socioeconomic research, so examples are organized around knowledge points and team learning contexts to help students understand and utilize government websites, professional financial data, and electronic yearbooks. Media literacy and information evaluation aim to cultivate critical thinking and understanding of differences between traditional academic communication environments and new media environments with collaborative, social functions, and how to evaluate and use open academic resources. Literature review writing and proper citation focus on helping students master paraphrasing, understand different reference formats, and use citation relationships to understand research development.

3.3.2 Teaching Activity Organization Teaching activities follow the established framework, principles, and syllabus. Based on practical feedback, several points deserve attention:

- (1) **Topic Generation Methods.** Initially, topics were generated by librarians proposing several thematic directions based on professional relevance and common interest principles, with teams selecting and refining based on interest (e.g., competition between taxis and ride-sharing, Disney and Shanghai urban development, telecom fraud). However, insufficient background knowledge among teams hindered effective feedback. The revised strategy has the teaching team determine a broad theme (e.g., “employment”) with refinement suggestions (e.g., job seekers, employers, employment discrimination/inequality, self-employment), allowing teams to choose one research direction while individuals determine specific topics.

This modification enables all teams to discuss different aspects of the same theme, making it easier for students to participate in other teams’ discussions and providing scope for teaching content (e.g., topic selection, information retrieval) and scaffolding design.

- (2) **Example-Based Teaching.** For most students without research experience, examples concretize abstract research steps, especially when combined with real learning contexts and experiences, helping students understand content and task requirements.

For literature review and evaluation, professional research papers’ theoretical terminology and academic expression can be daunting for inexperienced undergraduates, causing learning fatigue and disengagement. When teaching this

content, librarians referenced a Zhihu post by an expert in life economics about “university roommates’ impact on academic performance” [26] to help students understand how to write a good literature review. This example integrated search term selection (synonyms, antonyms, broader/narrower terms), content requirements, viewpoint organization, paraphrasing, and reference usage.

- (3) **Team Learning Activities.** Initially, free team formation led to clustering of international students, same majors, and same grades. Librarians later determined team division methods at the beginning of the semester to avoid these issues.

After establishing the principle of same-theme, different-questions, requirements for member roles and tasks were adjusted: initially requiring pre-search and final search reports mid-semester and at the end, with members dividing tasks (e.g., by theme, language) and leaders coordinating and presenting. Recent practice treats the mid-term literature research report and final literature review as final products of inquiry-based learning, de-emphasizing the leader role and focusing more on the team’s peer scaffolding function—primarily discussing and exchanging experiences and problems in topic selection and literature retrieval.

- (4) **Teaching Feedback.** Feedback is obtained through questionnaires, discussion minutes, assignments, classroom and after-class observations, and interviews with different student types.

Pre- and post-course surveys show students’ information retrieval abilities generally improved; they gained deeper understanding of research processes; increased emphasis on authority, standardization, and reliability of sources; became more cautious about using web pages as references; and preferred academic journals, dissertations, and factual data.

Student evaluations in questionnaires and interviews focus on: practical content; good complement to literature retrieval courses. However, as an elective, the course has many assignments; for international students, understanding course materials and assignment requirements is relatively difficult, suggesting English materials should be provided.

4 Reflection and Discussion

Reflections on using guided inquiry to design teaching activities include:

4.1 Information Search Process Model as Diagnostic Tool

During course design, the information search process model serves as the theoretical framework for designing all teaching points, with resources and activities organized around it. During implementation, it provides a diagnostic tool for reflection, helping the teaching team understand student learning performance (information-seeking behaviors), capture difficulties and challenges, and adopt targeted interventions to help students acquire new knowledge and skills under guidance.

The teaching team's understanding of "process" is crucial—not limited to classroom activities but including the entire learning process of after-class self-study and discussion. Instructional design must consider both in-class and after-class time, using appropriate methods to guide students. Difficulties and challenges encountered during learning can drive reflection and improvement of instructional design to find appropriate intervention methods.

4.2 Factors Affecting Team Learning Effectiveness

Guided inquiry features team learning as its basic characteristic. Team learning effectiveness is closely related to communication and feedback mechanisms, individual differences, and student learning psychology.

Regarding communication and feedback mechanisms, team size and number directly determine feedback network complexity. With 4-8 members per team, smaller classes facilitate better intra-team, inter-team, and librarian-team communication. Insufficient information exchange among some members may lead to poor assignment quality. The teaching team must design communication methods (e.g., in-class or WeChat group feedback) to ensure smooth information exchange and positively impact learning outcomes.

Individual differences among team members also affect team performance. Students from different grades, majors, or international backgrounds have different personal learning abilities. Uneven member levels objectively cause performance differences among teams.

More importantly, students' common confusion, misunderstanding, or anxiety during learning deserves teacher attention. In team learning, these negative learning psychologies can be reinforced among members, causing task goal deviation or failure. For example, the topic selection task requires collecting sufficient Chinese and foreign literature to refine specific research questions. Students often mistakenly believe that social development issues in China lack foreign literature support, searching only in CNKI. This actually relates to students' analytical understanding and English academic reading abilities. Teachers need to help students broaden perspectives and flexibly use retrieval tools and skills through multiple methods (lectures, team feedback, after-class tutoring) at appropriate times. This positively impacts resolving negative learning psychologies and improving overall class team learning effectiveness.

Timely and adequate team learning feedback in class significantly improves learning outcomes. For example, in spring and fall 2016-2017, the fall 2016 class had 147 students while spring 2017 had 43. Due to this size difference, team feedback time increased from 8 to 15 minutes per team in the spring semester, substantially extending presentation and librarian feedback time. Teachers used this extended feedback to identify and correct common team learning problems promptly, and the exchange process helped other teams reflect and deepen understanding. In large classes, ensuring timely and adequate team learning feedback is difficult, somewhat affecting team learning effectiveness. In final course

evaluations (out of 5), the spring semester's subjective average score (4.58) was significantly higher than the fall semester's (4.32).

4.3 Examples as Scaffolding

Examples play a crucial role in instructional design, serving as scaffolds for autonomous learning. Many terms (e.g., literature review) and operational environment descriptions (e.g., academic search engines vs. academic databases) are unfamiliar to students or easily confused with everyday language. Using examples when teaching knowledge points or assigning tasks—through illustration, explanation, and listing specific requirements—helps students better understand content and complete tasks.

The goal of information literacy instruction is to impact students' information awareness and behavior, helping them better use information to solve problems. Examples reduce cognitive load, especially for weaker students who can internalize them into internal guidance through repeated imitation and consultation with peers or librarians, thereby more effectively achieving learning objectives.

Implementing scaffolding intervention is costly, requiring substantial time and effort. Courseware and assignments must be modified each semester based on student characteristics, team tasks, and previous problems, undergoing multiple revisions before use.

4.4 Iterative Improvement of Instructional Design

Due to the relatively long cycle of credit courses, librarians must systematically design information literacy content. Since its 2015 launch, the course has undergone adjustments and improvements each semester based on learning progress and feedback from various channels, with new knowledge points added and supplemented. The information literacy course is currently in a growth period; iterative improvement is necessary for enhancing teaching quality. Syllabi, courseware, lecture notes, and assignment examples must be updated, adjusted, and revised timely to meet student needs.

Pre-course surveys each semester show students primarily expect to master database retrieval techniques. However, information literacy instruction extends beyond tool usage to focus on information behaviors throughout the entire research process, emphasizing information awareness and thinking. This requires librarians accustomed to traditional bibliographic instruction to make significant changes in teaching methods and content design.

Iterative improvement requires the teaching team to have an open learning mindset, good tool mastery, strong learning abilities, and awareness of latest trends in academic communication to enrich content and examples for sustainable development.

4.5 Absence of Teachers' Subject Perspective

Currently, library information literacy course teaching team members are primarily librarians, mostly with master's degrees in library or information science. This creates a lack of subject expertise when guiding topic selection. Librarians' topic modification suggestions often come from analyzing retrieval processes and results, proposing alternative search terms. For example, when searching foreign literature on "employment inequality," librarians help analyze core keywords "employment" and "inequality" and use EBSCO BSU search results to suggest related English concepts and synonyms to expand search scope.

Therefore, rather than an absence of subject perspective, this is an "inherent limitation" of independently offered information literacy credit courses. Guided inquiry aims to equip students with abilities to face uncertain, constantly changing information environments—something teachers cannot accomplish alone [9]. It requires librarians to create necessary information environments where students can explore, participate, create, and learn. In independent information literacy instruction, librarians' roles can be maximized, but how to manifest subject perspective is a question requiring teaching team consideration.

4.6 Efficiency of Knowledge Transfer

The efficiency of knowledge transfer from information literacy classrooms to professional learning practice ultimately determines the impact of information literacy education on student learning. The ultimate goal of scaffolding is fading—effective scaffolding use in learning processes positively promotes knowledge transfer.

Evaluating student performance after information literacy courses is challenging for libraries. Foreign literature often uses citation analysis of student reports to understand changes in academic information behavior. However, it's difficult to distinguish whether such changes result from information literacy education or other factors like subject teachers, experienced peers, or deliberate imitation.

Information literacy education should change and influence thinking patterns in information environments. How to operationalize and quantify these thinking pattern changes is a question requiring continuous attention and exploration by information literacy educators.

5 Limitations and Future Research Directions

Most published papers on information literacy instruction remain qualitative studies [27]. This study reflects on and evaluates teaching practice using existing library and information science and educational psychology research findings, revealing limitations such as lack of quantitative analysis and theoretical frameworks.

With only one class section per semester and large size variations (from 40+ to 140+ students), instructional improvements are implemented iteratively each

semester. Comparative studies are conducted through pre- and post-course questionnaires. Future research could track students who completed the course to examine knowledge transfer, or include students without information literacy education as control groups to provide more evidence of educational effectiveness.

Information literacy instruction is a continuous, iterative development process requiring ongoing observation, discovery, and summarization. Future research could explore teaching method comparisons, learning effectiveness evaluation, and scaffolding design effectiveness from educational and psychological perspectives.

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

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