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Reflections and Recommendations on Undergraduate Research Service Practices in University Libraries: Based on a UIUC Case Study and Survey Analysis of China's "Double First-Class" University Libraries (Postprint)

Authors: Hong Cheng, Qian Peng

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Abstract

[Purpose/Significance] Supporting undergraduate research is one of the missions of academic libraries and an important initiative that aligns with university development strategies. By drawing on exemplary foreign cases and grounding the analysis in domestic realities, this study provides beneficial recommendations for undergraduate research services in Chinese academic libraries.

[Method/Process] Through case study research, this paper analyzes the background, service content, service platforms, and support mechanisms of undergraduate research services at the University of Illinois at Urbana-Champaign Library, and summarizes their service characteristics. Through questionnaire surveys, it describes the basic situation of service positioning, content design, and personnel support for undergraduate research services in Chinese "Double First-Class" university libraries.

[Results/Conclusion] The study proposes that Chinese academic libraries need to attach importance to undergraduate research services, grasp the demand characteristics of undergraduate research services, develop distinctive research service programs, and establish long-term service guarantee mechanisms.

Full Text

Preamble

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Thoughts and Suggestions on Undergraduate Research Support Services in University Libraries: A Case Study of UIUC and Survey

Analysis of China's "Double First-Class" University Libraries

Hong Cheng, Qian Peng
Southeast University Library, Nanjing 210009

Abstract

[Purpose/Significance] Supporting undergraduate research is one of the missions of university libraries and an important initiative that aligns with university development strategies. Drawing on typical foreign cases and based on domestic realities, this paper provides useful suggestions for undergraduate research services in Chinese university libraries. **[Method/Process]** Through case study analysis, this paper examines the background, service content, platform, and guarantee mechanisms of undergraduate research services at the University of Illinois at Urbana-Champaign (UIUC) Library, and summarizes its service characteristics. Through questionnaire survey, it describes the current situation of service positioning, content design, and personnel support for undergraduate research services in Chinese "Double First-Class" university libraries. **[Result/Conclusion]** The paper proposes that Chinese university libraries need to attach importance to undergraduate research services, understand the demand characteristics of these services, develop distinctive research support projects, and establish long-term service guarantee mechanisms.

Keywords: undergraduate research; research support services; university library; "Double First-Class" construction

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Undergraduate research, known as a comprehensive curriculum innovation and major reform in contemporary American undergraduate education and academia, originated in 1969 when MIT established the Undergraduate Research Opportunity Program (UROP). It has gradually gained attention in the process of exploring innovative talent cultivation. In 1998, the Carnegie Foundation for the Advancement of Teaching published *Reinventing Undergraduate Education: A Blueprint for America's Research Universities*, which sparked a wave of reform in American undergraduate higher education. The report recommended conducting various activities to train undergraduate research capabilities and implementing research-based learning. Driven by organizations such as the Council on Undergraduate Research (CUR) and the National Conferences on Undergraduate Research (NCUR), the United States has formed a relatively complete undergraduate research system and accumulated rich theoretical and practical experience. Through long-term practice, CUR has developed a clear definition of "undergraduate research" as inquiry conducted by undergraduates that makes an original or innovative contribution to the discipline, a definition widely recognized by various sectors.

China's undergraduate research can be traced back to the 1990s when research universities such as Peking University, Tsinghua University, Fudan University,

and Zhejiang University took the lead in launching undergraduate research activities. In 2007, the Ministry of Education began implementing the “National Undergraduate Innovative Experiment Program” to explore and establish a teaching model centered on problems and projects. During the “Twelfth Five-Year Plan” period, the “National Undergraduate Innovation and Entrepreneurship Training Program” was implemented to promote the comprehensive development of undergraduate research activities. In recent years, driven by the national policy of “mass entrepreneurship and innovation,” innovation and entrepreneurship education has become the direction of higher education reform and development. In June 2018, the Ministry of Education convened the National Conference on Undergraduate Education in the New Era, explicitly proposing to promote ideological, conceptual, methodological, and model innovation in higher education and to seek development within an international framework. University talent cultivation models will be further optimized, with increasing emphasis on cultivating undergraduate innovation capabilities, and research training is currently recognized as an effective approach.

The Association of College and Research Libraries (ACRL) Guidelines for University Library Services to Undergraduate Students clearly state that libraries should provide services, resources, and guidance specifically designed for undergraduates to help them become more self-sufficient researchers, and that effective, high-quality undergraduate library services should support undergraduate education programs. Foreign scholars such as M. K. Hensley, S. L. Shreeves, and S. Davis-Kahl have surveyed and analyzed the disciplinary classification, thematic content, formats, collaboration, and sponsorship of library instruction for undergraduate research projects in American university libraries. Hensley and Davis-Kahl co-authored the monograph *Undergraduate Research and the Academic Librarian: Case Studies and Best Practices*, which systematically summarized service models and content for undergraduate research in American and Canadian university libraries. M. Niimi surveyed the types and characteristics of undergraduate research services in American and Canadian university libraries through questionnaires and interviews. A. Stamatoplos proposed that university libraries should participate in mentoring undergraduate research and transcend traditional service models, especially in information literacy education. J. Jones and L. Leligdon proposed that libraries promote the dissemination of undergraduate academic research through publishing services and workshops.

China’s *Regulations on Ordinary Higher Education Institution Libraries* state in Chapter 6 that libraries should actively expand information service fields, embed themselves in teaching and research processes, conduct subject services, and actively explore new services according to needs. Domestic scholars Que Chenchen and Tian Ji, and Zhang Ling introduced American university library undergraduate research awards and proposed exploring new models of information literacy education and developing information literacy education services embedded in the research process. Wang Qiang, drawing on the experience of Indiana University-Purdue University Indianapolis, proposed that libraries should correctly understand undergraduate research, create participation oppor-

tunities, and establish a guiding position. Zhang Jie proposed “guided” research services for libraries to meet the needs of undergraduate research training.

In summary, scholars at home and abroad have analyzed the positive role of university libraries in undergraduate research training through different cases and proposed many useful suggestions. However, studies of foreign cases have focused on overall descriptions or introductions of single service content, lacking complete and comprehensive discussion of individual cases, and in-depth investigations of domestic library undergraduate research services are rare.

2. Research Process

2.1 Research Methods

This study employs a combination of qualitative and quantitative research methods. The qualitative research primarily uses case study methodology to conduct in-depth analysis of typical foreign university library undergraduate research services, providing references for Chinese university libraries. The quantitative research mainly uses questionnaire surveys to investigate the current status of undergraduate research services in Chinese “Double First-Class” university libraries, thereby enabling targeted recommendations. The specific research framework is shown in [Figure 1: see original paper].

(1) Selection of Research Objects. The foreign case selected is the University of Illinois at Urbana-Champaign (UIUC) Library for the following reasons: First, relevant literature analysis shows that UIUC Library has abundant theoretical achievements and strong service concepts and awareness regarding undergraduate research services. Second, UIUC’s service model is mature with rich service content, making it a typical case for in-depth study. Third, UIUC’s undergraduate research services are university-wide rather than discipline-specific, demonstrating strong influence and comprehensiveness. The domestic survey selected “Double First-Class” university libraries because: First, “Double First-Class” universities are research universities and important forces in scientific and technological innovation that attach great importance to academic research and the cultivation of top-notch innovative undergraduate talents. Second, first-class universities and disciplines cannot be separated from first-class libraries, and the service capabilities of “Double First-Class” university libraries represent the highest level among Chinese university libraries.

(2) Analytical Framework. Following the structure of “service background—service content—service guarantee,” this paper conducts systematic analysis of both the foreign case and domestic survey objects, and then extracts service characteristics and proposes service recommendations. The analysis of service content is organized according to units such as resources, space, technology, personnel, collaboration, and policy, enabling the foreign case study and domestic survey to complement each other. Additionally, undergraduate research services have a synergistic relationship with other university-wide research services provided by libraries, and this paper includes relevant content in the analysis to

provide a relatively complete and comprehensive examination of undergraduate research services.

2.2 Data Sources

(1) **Case Materials.** Relevant materials were obtained through four approaches: Google keyword searches, investigation of UIUC's on-campus undergraduate research websites and library websites, content analysis of literature, and citation tracing. Data collection was conducted in June 2018.

(2) **Questionnaire Survey.** The basic design 思路 and structure of the questionnaire: First, the questionnaire instructions defined “undergraduate research” using the definition from the American Council on Undergraduate Research mentioned above. In China, university student innovation and entrepreneurship training, undergraduate research training, research competitions, and published academic papers all fall within the scope of undergraduate research. The questionnaire body consists of three parts: basic information (including university name and position), policy requirements for undergraduate research and on-campus undergraduate research activities; and the library's service work for undergraduate research, including service content, service methods, and service guarantees. In June 2018, an email invitation was sent to 36 “Double First-Class” universities in Category A to participate in an online questionnaire survey, targeting departments responsible for information consultation/subject services or library directors (party secretaries). A total of 18 valid questionnaires were received from 18 “Double First-Class” university libraries.

3. UIUC Library Undergraduate Research Service Case

3.1 Service Background

As a research university, UIUC has always been at the forefront of scientific research, and its undergraduate education also emphasizes cultivating students' research innovation capabilities. The university has detailed strategic planning and practical measures for undergraduate research. In 2012, it established the Office of Undergraduate Research (OUR) to promote, organize, coordinate, and fund university-wide undergraduate research activities, with relevant responsible persons in each college and department. OUR has launched a series of initiatives to promote undergraduate research training: First, establishing UIUC Undergraduate Research Ambassadors, staffed by high-achieving students who help OUR develop and maintain student-centered research programs. Second, offering undergraduate research workshops. Third, launching learning participation-based undergraduate research training programs and originality-focused undergraduate research certificate programs. Fourth, establishing Undergraduate Research Week to showcase the university's most outstanding undergraduate research or creative investigations. The symposium is the signature event of Undergraduate Research Week, including annual series of thematic exhibitions,

workshops, seminars, and signature events sponsored by departments or program units. The OUR website is built around undergraduate research, regularly posting relevant information, and students can also apply for research projects, funding, and register for research activities through the site. Undergraduates have opportunities to participate in research in any discipline, including humanities and arts, and can receive mentorship. UIUC has a strong undergraduate research atmosphere, with high-level support from the university in terms of policy and practical activities, establishing a demand mechanism and content direction for library services. The OUR and the library also have a good cooperative relationship.

3.2 Distinctive Services

3.2.1 Research Information Access—Building an Undergraduate Research Blog The UIUC Library and OUR cooperated to establish an undergraduate research blog in 2014. Initially presented as an independent website, the blog was migrated to the OUR official website in 2016. The undergraduate research blog closely follows relevant activities or research assistance related to formal UIUC undergraduate research programs. Published content includes UIUC undergraduate research highlights, undergraduate research conferences and seminars in various disciplines, library resources and services designed to meet student and faculty needs, and national undergraduate conferences. The blog serves as a channel for timely information release.

3.2.2 Research Publication—Hosting Undergraduate Research Journals With support from OUR, the UIUC Library hosts eight undergraduate research journals, providing undergraduate researchers with opportunities to publish papers in academic journals. These journals cover literature and arts, social sciences, agricultural environmental sciences, anthropology, and many other disciplines, all using an open journal system for submissions. Several specialized journals have received sponsorship from corresponding colleges, such as the UIUC Undergraduate Literary Criticism Magazine sponsored by the English Department, the peer-reviewed *Journal of Undergraduate Ethnography of the University* sponsored by the Ethnography of the University Initiative (EUI), and the i-ACES journal sponsored by the Academy of Excellence in Teaching. The library also provides links to undergraduate research journal resources hosted by other institutions.

3.2.3 Research Presentation—Hosting Undergraduate Research Image Competition Since 2014, the library has hosted the Undergraduate Research Image Competition, receiving organizational support from OUR and funding from the Division of Intercollegiate Athletics. The competition is open to all undergraduates registered in the spring semester. Students may submit only one work individually and must have a faculty member as a guarantor. Submissions must include: an image representing specific or abstract meaning of their research; and a 100-200 word statement clarifying the relationship between

the image and their research. The statement should avoid academic terminology and use accessible language to attract the attention and imagination of both experts and general audiences. The library specifically reminds participants that submitted images must be created by themselves; images entirely from third parties are not allowed, and partial use of third-party copyrighted images or materials requires relevant permission or fair use. Evaluation criteria include: the relationship between image, text, and research; creativity; and visual effects. Winners receive \$200-300 awards, with award ceremonies held at the Undergraduate Research Symposium and winning works exhibited. The library aims through this competition to: provide students with opportunities to think about the research process, discoveries, and significance, and how to present research using visual effects; develop students' creativity with information; raise questions around academic communication in the design learning process; and help students confront the complexity of copyright and online resources.

3.2.4 Research Resource Navigation—Building LibGuides Platform for Undergraduate Research

The UIUC Library's LibGuides platform contains rich resources related to undergraduate research services: First, guidelines for research poster design, content, printing, and archiving help students use visual elements to present research results at academic conferences, with detailed guidance on research posters especially for UIUC's The Ethnography of the University Initiative (EUI) student conferences and undergraduate research programs. Second, the Undergraduate Data Management Guide is specifically designed for students unfamiliar with research and data collection processes, covering basic knowledge of data management and best practices from the DataONE Best Practices database for effectively handling data throughout the data lifecycle. Specific content includes: concepts and value of data management, data terminology lists from government open data websites; concepts and value of data documentation, relevant resources and templates; concepts and value of data preservation, data preservation policies; file naming rules; data security and backup, on-campus cloud storage solutions; and other UIUC on-campus resources related to data management. Additionally, the library's LibGuides platform research resources section includes: research funding/scholarship guides, online academic seminar guides, research presentation guidance, research PPT production guidance, impact factors and other bibliometric knowledge.

3.3 Basic Services

In addition to distinctive services, the UIUC Library also provides many universal research services. These include: First, author rights and copyright information services to help scholars understand changes and trends in academic publishing, such as the open access movement and UIUC's open access policy. Second, data discovery services, a collaboration with the Center for Innovation in Teaching and Learning (CITL) Data Analysis Program to assist in finding and formatting digital and spatial data. Third, research data services, including: data management plans providing requirements and usage guidelines for data

management and sharing from funding agencies such as NSF and NIH; data organization covering file naming, file formats, and data description; and data preservation and sharing. Fourth, a data purchase program where researchers can apply to the library to purchase various data resources needed for research. Fifth, Survey Research Lab consulting services to help researchers create surveys and analyze survey data. Sixth, usability testing services, where the library provides usability lab space and related software to help record website or application experience effects, and also offers fee-based usability technology consulting in cooperation with technology companies. Seventh, offering research skills workshops (Savvy Researcher Workshop) where on- and off-campus experts and scholars are invited to teach professional knowledge and guide research.

3.4 Service Platforms

3.4.1 Scholarly Commons UIUC Library's undergraduate research services primarily rely on the library's Scholarly Commons. This space is dedicated to promoting users' research work, providing students and scholars with a technology-rich academic environment combining physical and virtual spaces, integrating library and campus information, technology, and services, and offering diverse training opportunities and learning resources. The Scholarly Commons has configured experts and subject librarians in multiple areas including academic communication and publishing, visual promotion, data discovery and analysis, and research and teaching support. On-campus institutions, project groups such as the CITL Data Analysis Program, Technology Services, and the Institute for Computing in Humanities, Arts, and Social Sciences have also provided personnel and resource support.

3.4.2 Expert and Scholar Database The library cooperated with the Vice Chancellor's Office to establish the Illinois Experts database, providing rich scholar information and research resources for undergraduate research services. Through this database, students can identify, discover, and understand experts in their research fields and potential collaborators, and find interesting or cutting-edge academic achievements. Information in the database is automatically updated from the campus human resources system and Scopus database, and users can also import research results from other databases and add images and text descriptions.

3.4.3 Institutional Repository The institutional repository IDEALS provides a reliable path for permanent preservation and access to on-campus digital academic resources for undergraduate research, integrating various types of UIUC undergraduate research works and achievements. These include: academic reports released during Undergraduate Research Week; research posters produced for academic symposia; academic papers included in undergraduate research journals; undergraduate research image competition works; and outstanding UIUC undergraduate theses and Summer Research Opportunities Program academic reports.

3.5 Service Characteristics

3.5.1 Diversified Resource Construction The UIUC Library effectively collects and organizes various types of undergraduate research resources, including: on-campus undergraduate research-related departments and institutions, program information; activity and conference materials; academic papers; academic works; research data; and online research resources. These are revealed and stored through multiple channels such as establishing an undergraduate research service homepage, undergraduate research blog, LibGuides platform, and institutional repository.

3.5.2 Specialized Service Content UIUC Library's research services cover the entire lifecycle of research activities. For the undergraduate research group, the library has also designed specialized service content, particularly in the area of academic information dissemination and communication. The library has carried out rich and diverse research activities to promote the publication of research results and the output and display of research creativity, providing effective platform service guarantees.

3.5.3 In-Depth Internal and External Collaboration and Support UIUC Library's undergraduate research services not only rely on the Scholarly Commons but also receive collaborative support from departments such as the Scholarly Communication and Publishing Department and the Research Data and Services Department. The library also has very close cooperation with OUR, the Division of Intercollegiate Athletics, and program groups in service planning, organization, implementation, and funding. The library has assigned a dedicated liaison librarian for undergraduate research services, responsible for managing publicity for undergraduate research journals and coordinating the undergraduate research image competition. This librarian also serves as a member of the campus Undergraduate Research Advisory Committee, assisting in formulating OUR's goals and reviewing proposals for the undergraduate academic symposium.

4. Current Status of Undergraduate Research Services in China's "Double First-Class" University Libraries

4.1 Undergraduate Research Activities

Among the 18 "Double First-Class" universities surveyed, more than half (61.12%) have certain requirements and specifications regarding research in their undergraduate graduation conditions. Various types of undergraduate research activities are currently being carried out, as shown in . The more common activities include conducting undergraduate research projects/competitions (88.89%), holding undergraduate research lectures (77.78%), and mentoring undergraduate research through a tutorial system (72.22%). Some universities have also implemented awards for outstanding

undergraduate research works (44.44%), held undergraduate research seminars (33.33%), established undergraduate research studios (33.33%), and set up undergraduate conference attendance funds (27.78%). Only two universities have established dedicated student research activity websites or forums, and one university hosts an undergraduate academic journal. Additionally, respondents from four university libraries indicated they were not very familiar with their institution's undergraduate research policies or activities.

4.2 Service Content

As shown in , in terms of resource construction, most libraries (72.22%) have incorporated undergraduate research needs into their resource procurement plans, half (55.56%) have established undergraduate research characteristic resource databases, and some (33.33%) have built undergraduate research resource recommendation/navigation systems. Additionally, two directors respectively stated that undergraduates mainly receive general education in specialized courses, and that the literature resources and services needed by undergraduates and graduate students cannot be completely separated and should be considered holistically.

In terms of information services, the vast majority of libraries have developed customized information literacy education courses for undergraduate research (88.89%), specialized lectures (88.89%), and writing software training (88.89%). Many libraries have also conducted research output verification (83.33%), literature research for research projects (72.22%), journal submission guidelines (72.22%), research project novelty searches (66.67%), patent information analysis (55.56%), and intellectual property and academic norm education (50%). Only a few libraries offer research data management (33.33%) and research communication community/platform services (16.67%).

Regarding targeted services for undergraduate research, seven libraries provide guidance for university student innovation and entrepreneurship training programs and undergraduate research competitions; four libraries provide guidance for the Student Research Training Program (SRTP); two libraries indicated they provide auxiliary support for undergraduate research projects or related resource and service lectures; and two libraries stated they currently have no similar targeted services.

4.3 Service Methods

As shown in , more than half of the libraries collaborate with university departments (72.22%), colleges (61.11%), or faculty (61.11%) to participate in undergraduate research guidance. There are also certain proportions of temporary or one-time services (61.11%) and independent targeted services by librarians (38.89%). A few libraries have established dedicated librarians (22.22%) or teams (16.67%) for undergraduate research. Some libraries stated they would not establish dedicated positions for undergraduate research services, believing

that subject librarians' college-oriented services already include this work.

4.4 Service Guarantee

As shown in , most participating libraries affirmed their rich literature resources (94.44%), strong subject service team capabilities (77.78%), adequate library facilities (72.22%), and advanced technical equipment (66.67%). One-third of libraries believed that undergraduate students have urgent needs for library research services, and only three libraries indicated that the university level has explicit requirements for libraries to develop undergraduate research services.

Regarding difficulties in developing undergraduate research services, more than half of libraries (55.56%) believed that lack of collaboration with colleges and administrative institutions is the main obstacle, followed by absence of university policies on undergraduate research (44.44%). Some libraries also believed that low undergraduate research literacy (27.78%), insufficient librarian capabilities (27.78%), inadequate library promotion (27.78%), lack of library space resources (22.22%), insufficient library funding (16.67%), and lack of understanding of undergraduate research demands (5.56%) also constrain service development to varying degrees.

4.5 Survey Conclusions

Through the survey, this paper draws the following conclusions:

(1) Undergraduate research receives attention at the university level, but implementation is insufficient. Currently, many “Double First-Class” universities surveyed have explicitly required undergraduate research at the university level and have carried out various forms of undergraduate research activities, especially undergraduate research projects/competitions which have become relatively popular. In promoting the cultivation of undergraduate research capabilities and the exchange and transformation of research results, there are already some incentives and measures, but most universities have not implemented them sufficiently.

(2) Libraries have begun to pay attention to undergraduate research services, but service awareness is not strong. Libraries already have some understanding of their institution's undergraduate research activities. Regarding the positioning of undergraduate research services, there are currently two viewpoints: One affirms the development trend and urgent need of undergraduate research in universities and believes libraries should make new efforts to actively promote it. The other holds a reserved attitude toward the importance and universality of undergraduate research, believing services should be provided when needed but that libraries do not need specialized planning for all aspects of undergraduate research.

(3) Libraries have already implemented some service content, but service levels vary and service design lacks systematization. Each library

has different understanding and emphasis on undergraduate research, with significant differences in content design and personnel support. Currently, libraries have made many explorations in research services, many of which are directly applied to support undergraduate research. However, in terms of content design, there is still a lack of targeted and distinctive services. “Double First-Class” university libraries have relatively favorable resources, personnel, and technical conditions but have not fully exploited them to serve undergraduate research. The vast majority have not established any undergraduate research-related service platforms at either the university or library level. There is also a lack of communication and long-term cooperation mechanisms between libraries and colleges and administrative institutions.

5. Recommendations for Chinese University Libraries to Develop Undergraduate Research Services

5.1 Attach Importance to Undergraduate Research Support Services

Library service goals and functions should adapt to university talent cultivation objectives. Research training is an effective way to promote the cultivation of undergraduate innovation capabilities and should have a fused and mutually beneficial relationship with undergraduate general education and specialized basic education. Foreign university libraries have increasingly attached importance to and deeply participated in undergraduate research capability cultivation, which has undergone long-term development and exploration to form a relatively complete system. However, the awareness and cognition of undergraduate research support services in Chinese university libraries have not kept pace with the trend of innovative talent cultivation in higher education. Libraries should attach importance to undergraduate research support services conceptually and actively undertake related work; closely follow undergraduate education policies; comprehensively observe the undergraduate research environment and management mechanisms; and encourage and promote undergraduate creative inquiry activities. “Double First-Class” universities already have policy requirements for undergraduate research. Developing undergraduate research services can leverage library resources and talent advantages to realize the functional value of libraries in higher education innovation and development.

5.2 Understand Basic Patterns and Characteristics of Undergraduate Research Service Demand

Compared with graduate and faculty research activities, undergraduate research places greater emphasis on the “research process” and cultivation of “preliminary” research capabilities, without excessive requirements for disciplinary background and knowledge depth, and has greater freedom and breadth in research content selection. Undergraduates’ understanding of research basically starts from zero, and their demand for research services naturally differs from that of graduate students and faculty. Only by being user-centered and understanding

the basic patterns and characteristics of undergraduate research service demand can libraries effectively perform their service work. Focusing on undergraduate research activities carried out by universities, libraries should investigate undergraduates' needs for research writing, research competitions, and research training to clarify service goals and directions. Libraries can also contact relevant university institutions or mentors to obtain feedback information during the organization and guidance of undergraduate research to build targeted and personalized service strategies.

5.3 Actively Develop Distinctive Research Service Projects

Currently, the main targets of research support services in Chinese university libraries are graduate students and faculty. Undergraduate research support services represent both a brand-new service field for libraries and an extension of existing research support services in terms of service targets and innovative excavation of service content. Undergraduate research support services are still established under the overall library service background and should make full use of existing research service resources, technology, and personnel, integrating innovation and teaching students according to their aptitude. Considering the characteristics of undergraduate research and differences in demand, libraries can focus on cultivating undergraduates' research interests and academic creativity exchange, and actively develop distinctive research service projects.

First, establish undergraduate research characteristic resource databases. On the one hand, effectively collect, organize, and reveal notifications, reports, and conference materials for on- and off-campus undergraduate research competitions, seminars, and lectures. On the other hand, actively seek autonomous submission of undergraduate research results from the university and permanently preserve and share these results at different levels. This provides undergraduates with more effective channels to obtain research information and services.

Second, conduct research literacy education for undergraduates. Help undergraduates with zero foundation to initially understand research and develop sincere research attitudes and scientific research methods. Libraries can integrate existing knowledge and experience in information literacy education and academic ethics to innovate research lecture and course content.

Third, conduct diversified research exchange activities. For example, establish undergraduate research activity weeks or open days, organize undergraduate academic seminars, academic salons, and research results exhibitions; hold undergraduate research-related knowledge or creativity competitions oriented toward interest and stimulating student innovation capabilities, which can include certain rewards.

Fourth, embed in undergraduate research training programs and competitions. Conduct tracking services around the processes of research training programs

and competitions, from application and implementation to completion or reporting.

5.4 Establish Long-Term Research Service Guarantee Mechanisms

In the environment of deepening innovation and entrepreneurship education reform in universities, libraries should seize the opportunity of the times, actively seek interactive development with university teaching construction, and establish long-term research service guarantee mechanisms. First, strengthen cooperation with colleges and university undergraduate research management departments to jointly promote the construction of undergraduate research service platforms, such as undergraduate research websites, interactive communities, and relevant institutional repositories, winning more policy and funding support through actual high-quality service effects. Second, in terms of service team construction, libraries can establish undergraduate research service liaison librarians, student consultants, and volunteer teams based on existing subject services and research service talent teams to promote service publicity and information sharing. Libraries can become important interactive venues for undergraduate research and help gain more external attention and support.

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Author Contributions

Hong Cheng: Framework design, case and survey data collection, paper writing.
Qian Peng: Topic guidance, revision suggestions.

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

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