Design and Implementation of a Network Platform for University Reading and Writing Centers: A Case Study of the Southwest Jiaotong University Reading and Writing Center (Postprint)

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Abstract

[Purpose/Significance] Using the library as a fulcrum to integrate reading promotion and writing instruction will more effectively enhance university students' reading and writing competencies; establishing an information technology-supported network platform for reading and writing will provide important support for its teaching and management. [Method/Process] Taking the Southwest Jiaotong University Reading and Writing Center as an example, focusing on the network platform construction of the Reading and Writing Center, through comparative analysis of module configurations and distinctive content of websites from 10 related domestic and international institutions, and according to the Center's functions, positioning, operational modes, and work content, the network platform for the Reading and Writing Center is designed. [Results/Conclusions] Platform usage demonstrates that platform-centered teaching and management provides effective support and assistance, also provides technical guarantee for the development of university reading promotion and writing competency cultivation work, and can also serve as a reference for platform construction of related functional institutions.

Full Text

Design and Implementation of a University Reading and Writing Center Network Platform: A Case Study of the Southwest Jiaotong University Reading and Writing Center

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Abstract: [**Purpose/Significance**] Taking the library as a fulcrum and combining reading promotion with writing instruction can more effectively enhance university students' reading and writing abilities. Establishing an information technology-supported network platform for reading and writing will provide crucial assistance for teaching and management activities. [**Method/Process**] Using the Southwest Jiaotong University Reading and Writing Center as an example and focusing on its network platform construction, this paper designs the platform based on a comparative analysis of module configurations and distinctive features across 10 relevant institutional websites at home and abroad, while considering the center's functions, positioning, operational model, and work content. [**Result/Conclusion**] Platform usage demonstrates that teaching and management centered on the platform provides effective support and assistance, offers technical guarantees for university reading promotion and writing ability cultivation, and can serve as a reference for platform construction at similar institutions.

Keywords: writing center; reading and writing; network platform; website comparison; design and implementation
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1 Research Background and Literature Review

With the rapid development of information technology, people's needs have undergone tremendous changes, and the functional positioning of libraries has evolved accordingly. As information centers, libraries play an increasingly important role in reading promotion activities due to their rich information resources and professional staff advantages.

Many writing instruction institutions (such as writing centers and writing labs) in universities worldwide have begun collaborating with libraries. Libraries' rich collections provide convenient document support for writing centers, while their spacious and quiet venues can serve as learning commons, and professional information literacy educators can exchange and learn with course instructors to jointly complete student writing cultivation [**?**]. Thus, writing centers also provide a new pathway for expanding modern library functions.

Writing and reading are closely connected. As Ye Shengtao stated: "Good reading makes it easy to achieve good writing, and good writing also benefits good reading." Reading absorbs knowledge, while writing completes expression [**?**]—the two complement each other. For university students, reading is knowledge reserve, and writing is knowledge application. Therefore, using the library as a fulcrum to organically integrate the two, using reading to drive writing and writing to promote reading, will more efficiently enhance university students' reading and writing abilities.

Based on the complementary relationship between reading and writing, Southwest Jiaotong University established a Reading and Writing Center for university students. Positioned as a grassroots teaching organization, the center targets primarily undergraduate students, operates under a responsible professor system, integrates the university's literature resources with academic affairs and teaching strengths, and establishes a "cross-department, cross-school, cross-major" teaching team to cultivate students' reading and writing abilities through online and offline instruction and tutoring. The center aims to leverage the library's rich print and electronic resources, integrate faculty strengths, and utilize the powerful information storage, real-time interaction, and convenient flexibility of network platforms to help students improve their reading and writing competencies.

In this highly networked era, people's access to information and knowledge is undergoing significant changes. Establishing an information technology-supported network platform will provide important assistance for the teaching and daily operations of the Reading and Writing Center.

There are few precedents in China for integrated reading and writing learning institutions, so no relevant literature on "reading and writing" website construction was found. In literature on teaching website construction, many design principles and column configurations share similarities with reading and writing websites. For example, Fan Ping'ai et al.'s research on quality courses and teaching website construction [**?**] and Guo Lizhou et al.'s work on network course teaching website design and construction [**?**] discuss website design principles including modularity, operational simplicity, strong interactivity, and browser compatibility, emphasizing website presentation and user experience—principles applicable to reading and writing website construction. In Guo Wei et al.'s course teaching website design research [**?**] and Zhan Wenfa et al.'s teaching website design and implementation [**?**], common columns include course and faculty introductions, courseware and video downloads, assignment submission, and online Q&A, with special features like online examinations, online tutoring, and learning forums. Some of these columns are also suitable for reading and writing websites. Therefore, reading and writing website construction can reference teaching websites while incorporating distinctive features.

2 Platform Design for the Reading and Writing Center

2.1 Comparison of Writing Center Websites

Nearly all American universities have writing centers, such as the University of Alaska Anchorage and Birmingham-Southern College, whose primary responsibilities are improving students' academic writing and analytical thinking skills and helping increasing numbers of international students adapt to American university education [**?**]. In China, however, writing centers are relatively rare, with more mature examples including the Shanghai University Literary and Creative Writing Research Center and the Huazhong University of Science and Technology Contemporary Chinese Writing Research Center. This paper selected 10 representative writing center websites from mainland China, Hong Kong, Macau, and abroad for comparative analysis of their architecture and module design.

These 10 websites include foreign public university writing centers (e.g., the University of Alaska Anchorage Writing Center, the largest in Alaska's university system; Troy University Writing Center, recognized as one of the top universities in the southeastern United States), foreign private university writing centers (e.g., Birmingham-Southern College Writing Center, renowned as one of America's top liberal arts colleges), top universities in Taiwan and Macau (e.g., National Tsing Hua University Writing Center, National Taiwan University Writing Center, Global Chinese Writing Center at National Taiwan Normal University, and University of Macau Writing Center), and two mature domestic writing centers (Shanghai University Literary and Creative Writing Research Center and Huazhong University of Science and Technology Contemporary Chinese Writing Research Center).

2.1.1 Comparison of Writing Center Module Configurations Through systematic analysis of modules across these 10 writing center websites, we found that except for the Global Chinese Writing Center with 16 modules, all others had 10 or fewer modules. These modules can be broadly categorized into three types: basic modules, functional modules, and characteristic modules. Basic modules are essential website components, including "Home," "About Us," and "Contact Us." Functional modules primarily comprise specific services provided to users, including "Center Announcements," "Faculty," "Lectures," "Writing Guidance," and "FAQ." Characteristic modules are customized services unique to each writing center.

A comparison of basic and functional modules between Chinese and foreign writing centers is shown in Table 1 .

Table 1 Comparison of Basic and Functional Modules Between Chinese and Foreign Writing Centers [?]

Among basic modules, "Home" serves as the entry point to the writing center website, showcasing and indexing the entire site's content. The "About Us"

module is crucial for users to understand the writing center's profile and specific functions, systematically introducing the background, mission, purpose, and tasks of the center's establishment. "Contact Us" provides the writing center's contact information (e.g., QQ, Email, phone) to facilitate communication.

Among functional modules, "Center Announcements" publishes notices and notifications. "Faculty" introduces tutoring staff basic information including name, title, education, experience, and publications. "Lectures" posts information about writing center seminars (some centers hold occasional literary writing lectures). "Writing Guidance" provides writing instruction, suggestions, and tutoring to students through online or email methods. "FAQ" answers frequently asked questions from students.

The module comparison reveals that most writing center websites include basic modules like "Home" and "About Us," while only three adopt "Contact Us," primarily because writing centers typically have clearly defined service content and target audiences requiring no external contact. For functional modules, most websites feature "Faculty" and "Writing Guidance" as core functional modules. The "Lectures" module is generally only set up in centers with literary writing functions. Since writing is a highly personalized activity with few standardized questions and answers, many websites do not include the "FAQ" module.

2.1.2 Comparison of Writing Center Characteristic Content Beyond basic and functional modules, the 10 selected Chinese and foreign writing center websites also include characteristic modules tailored to each center's specific circumstances for writing tutoring. For example, National Tsing Hua University Writing Center's Student Writing Gallery publishes award-winning student works from writing competitions for appreciation. Troy University Writing Center's John Schmidt Student Success Center provides programs and services to enhance student academic performance and support career development and social growth. Table 2 compares specific characteristic content across the websites.

Table 2 Comparison of Writing Center Website Content [?]

[The table content would be preserved here with proper formatting]

2.2 Platform Design Philosophy

Through comparison of relevant websites at home and abroad, we identified universal functions for similar website construction, while characteristic modules also provided beneficial references. Based on these findings and through multiple interviews with the Southwest Jiaotong University (hereafter "the University") Library Reading and Writing Center website construction team, academic affairs office, center staff, and instructors, we established the following functional requirements:

1. Basic functions for reading and writing work, such as providing search-

able learning materials, user-friendly tools, center announcements, lecture notifications, faculty introductions, and online consultation.
2. Characteristic teaching functions, such as student appointment scheduling with instructors and online assignment submission.
3. Functions leveraging the University's distinctive resources, such as Southwest Jiaotong University's classic reading lists, instructor lesson plans, and teaching videos.
4. Compatibility with multiple device types.
5. Ensuring platform data security and integrity.

Based on these functional requirements, the platform design philosophy emphasizes openness, interactivity, compatibility, and security. The open nature of network platforms can provide multi-angle, multi-faceted massive learning resources. Interactive functions can facilitate convenient and efficient communication between teachers and students and among students themselves. Compatibility requires the network platform to support various device types, adapting to modern society's "mobile fragmentation" learning characteristics. Additionally, network platform construction must ensure overall system and data security and stability. The platform's main contents include:

1. Accurately and completely providing various digital resources required for center operations, including books, journals, videos, and other online resources.
2. Providing various writing standards and norms for university students, such as dissertation writing standards, journal submission guidelines, and national standards for punctuation usage.
3. Offering University-specific integrated resources, such as Southwest Jiaotong University classic reading recommendations, instructor lesson plans, and student assignments.
4. Providing communication, interaction, and Q&A functions, such as online course selection, instructor appointment, assignment grading, and consultation.
5. Providing various tools to support reading and writing, such as reading software and writing templates.

2.3 Platform Module Design

The network platform adopts a modular development approach, decomposing the system into a series of functional modules that each complete independent functions and can be deployed separately. This modular approach enhances system flexibility and scalability, makes functions easier to reuse or replace, and ensures more stable and efficient applications [**?**].

Based on the above functional requirements and main contents, the Southwest Jiaotong University Reading and Writing Center network platform includes three primary functional modules: Reading Resources Module, Writing Resources Module, and Service Module. The platform module architecture is

shown in Figure 1 [Figure 1: see original paper].

Figure 1 [Figure 1: see original paper] Platform Module Architecture

The Reading Resources Module primarily includes classic reading content (Southwest Jiaotong University's annual classic reading lists, classic reading thematic databases), books, journals, videos, and internet resources. The Writing Module mainly includes various books, journals, videos, internet resources, and writing templates related to writing. The Service Module primarily includes instructor appointment scheduling, online consultation, news announcements, and tool downloads.

2.4 Overall Platform Design

The Southwest Jiaotong University Reading and Writing Center platform employs a three-tier Web architecture: the bottom data storage layer, the middle business logic layer, and the top presentation layer. Each layer has clearly defined functions, is mutually independent, and provides support for upper layers. The platform architecture is shown in Figure 2 [Figure 2: see original paper].

Figure 2 [Figure 2: see original paper] Overall Platform Architecture

The bottom layer is the data storage layer, which uses a relational database to persistently store various platform data. The data layer includes a scheduled task function primarily for regular data processing, such as generating appointment lists, cleaning expired content, and other system maintenance tasks.

Above the data storage layer is the business logic layer, which includes a data access module, user authentication module, and service request processing module. The data access module connects to the underlying database and provides data access interfaces for other business modules. This module encapsulates database connection, querying, updating, transaction processing, and closing details, offering simple and secure interfaces for database operations. Since the platform involves extensive data reading, writing, and interaction, the data access module design avoids common data access errors and improves data access quality. The user authentication module handles user login information authentication. The platform includes two user types—teachers and students—and provides user registration functionality, authenticating both types and granting corresponding usage permissions. The service request processing module handles various user interaction operations and processes user requests. This module includes the platform's main business processing operations and is designed to be extensible according to business requirements to accommodate changing needs. The business logic layer uses object-oriented technology, with modules that are both independent and conveniently interoperable, offering flexibility and scalability.

The top layer is the presentation layer, which adopts a flat design style with clear functions, minimal interface layers, and simple operations for users to

obtain information. It also employs responsive design to accommodate access from different user terminals.

2.5 Detailed Design of Key Modules

Based on the overall platform design, we conducted detailed design for several key modules.

2.5.1 Appointment Module Design The appointment process is shown in Figure 3 [Figure 3: see original paper]. First, the platform database regularly generates instructors' consultation schedules, which instructors can log in to modify. The consultation schedule includes time, location, main content, etc. Locations are library meeting rooms and discussion spaces, with the system providing room images, area, capacity, and usage status to help instructors select appropriate venues. After consultation sessions, rooms are automatically released by the platform for other instructors to select. Students can log in to view instructor consultation schedules and book corresponding time slots. If a slot is fully booked, students can select alternative times or instructors. Instructors can log in to view enrollment status.

2.5.2 Consultation Module Design The consultation process is shown in Figure 4 [Figure 4: see original paper]. Students log in to submit questions online. Instructors then log in to view student questions and submit responses. Different instructors can submit multiple responses to the same question to better assist students, who can check response status at any time.

2.5.3 Assignment Module The assignment process is shown in Figure 5 [Figure 5: see original paper]. Instructors log in to the platform to assign work. Students then log in to view assignments and complete them according to instructor requirements. Students can also submit assignments to designated instructors for grading. After receiving submissions, instructors grade and score them. Students can view grading feedback and revise assignments for resubmission until satisfied.

2.6 Database Design

2.6.1 Overview The Reading and Writing Center platform database is designed according to the above platform requirements and divided into platform data objects and scheduled tasks. Platform data objects mainly include teacher tables, student tables, resource tables, appointment tables, consultation tables, assignment tables, etc. Scheduled tasks primarily include generating new consultation schedules and updating appointment statuses.

2.6.2 Data ER Diagram The platform database ER diagram is shown in Figure 6 [Figure 6: see original paper]. Figure 6 lists main entities, attributes, and relationships in three parts:

1. **Appointment Part**: A one-to-many relationship exists between instructors and consultation schedules, and between consultation schedules and actual appointments. Since students can book multiple time slots, a many-to-many relationship exists between students and appointments.
2. **Consultation Part**: A one-to-many relationship exists between students and questions (one student can ask multiple questions). Since different instructors can respond to the same question and one instructor can respond to multiple questions, a one-to-many relationship exists between questions and responses, and a many-to-many relationship between instructors and responses.
3. **Assignment Part**: A one-to-many relationship exists between instructors and assignments (one instructor can assign multiple tasks). Each assignment may have submissions from different students, so a one-to-many relationship exists between assignments and reports. Since one student can submit multiple reports for different assignments, a one-to-many relationship exists between students and reports.

Figure 6 [Figure 6: see original paper] Platform Database ER Diagram

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3 Implementation of the Reading and Writing Center Platform

3.1 Environmental Support and Development Tools

3.1.1 Platform Operating Environment The Reading and Writing Center platform runs in the University Library's newly built virtualized disaster recovery platform (established in 2016), ensuring effective system and data security and stability.

3.1.2 Network Environment The University's Jiuli and Xipu campus libraries have comprehensive wireless coverage and 1,861 wired network access ports with 1,000M backbone network bandwidth.

3.1.3 Development Technologies and Tools The platform employs popular web system development technologies, based on a B/S architecture, developed in a Java environment, using MySQL database, running on Linux operating system, with Eclipse and Dreamweaver as development tools. Details are shown in Table 3 .

Table 3 Development Technologies and Tools

Architecture	Operating System	Development Tools	Programming Language	Application Server	Database
B/S Mode	CentOS 6.5	Eclipse 3.6 and Dreamweaver CS5	Java 1.6	Apache Tomcat 6	MySQL 5.5

3.2 Main Implementation Methods and Core Technologies

Using B/S architecture, users can conveniently access the platform through web browsers without installing client software. The platform functions as both a website and management system; some modules are browsable without login, while personalized functions require user authentication.

The platform uses Tomcat application server, Java development language and tools, ensuring platform portability and a framework for dynamic website development. The front-end employs JQuery, Ajax, Bootstrap, and Flash technologies to generate powerful interactive, responsive applications. It provides various resource types including books, journals, and videos, presenting them completely to users through multimedia technology.

3.2.1 Front-End Functionality Implementation The front-end includes three main functional areas: Reading, Writing, and Services. The top of the main page displays user login information, followed by the main menu and website banner. The center contains core function navigation, with each function unit marked by prominent icons arranged in a tiled layout. Related function icons maintain consistent styling. The bottom includes relevant website navigation and copyright information. The main interface is shown in Figure 7 [Figure 7: see original paper].

1. **Reading Area**: Classic Reading, Books, and Journals columns link to corresponding e-book platforms; videos are viewable online.
2. **Writing Area**: Books and Journals columns link to e-book platforms; videos are viewable online; writing templates are available for student practice.
3. **Services Area**: Instructor appointment, consultation, and assignment submission require user login; news announcements are browsable without login.

The front-end interface design is clean with clear function navigation and consistent page style, reducing user difficulty.

3.2.2 Back-End Management Implementation Back-end management primarily targets service area functions. The top displays instructor login information and theme settings, with a main menu on the left and content area

on the right, plus copyright information at the bottom. The main interface is shown in Figure 8 [Figure 8: see original paper].

1. **Appointment**: Instructors view reader appointment status for their duty day.
2. **Consultation**: Instructors view reader questions, select questions to respond to, and can reply multiple times to the same question.
3. **News Announcements, Tools, Resources**: Instructors submit relevant content for browsing and downloading.
4. **Assignments**: Instructors view submitted assignments, fill in evaluation feedback, and can evaluate the same assignment multiple times. Students view feedback after login and can revise and resubmit.

The back-end management system is developed based on Bootstrap, a popular responsive website design framework using the latest web front-end development technologies with rich thematic layouts and flexible, powerful configuration—an effective tool for building RIA programs. It uses a rich text editor enabling online content editing similar to Microsoft Word with WYSIWYG functionality.

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4 Platform Testing and Usage Effectiveness

4.1 Platform Functionality Testing

Using JMeter to test each functional module, main test results are shown in Table 4 . Each function used 100 test cases to simulate user operations. Login processing took longer due to unified authentication interface access, but since login only occurs once, it is not frequently used. Other common functions responded in under 0.1 seconds, meeting platform requirements.

Table 4 Platform Functionality Test Results

Function	Test Cases	Avg Response Time (ms)	Max Response Time (ms)
Reading Resources	100	45	78
Writing Resources	100	52	81
Appointment Query	100	38	69
Appointment Processing	100	41	73
Consultation Query	100	35	65
Consultation Processing	100	42	71
Assignment Query	100	36	68
Assignment Processing	100	44	75

4.2 Platform Stress Testing

Using JMeter to test functions potentially subject to heavy concurrent usage, we simulated 100 simultaneous users based on estimated platform usage. Main

test results are shown in Table 5 . Each function used 1,000 test cases. Average response times increased slightly but remained under 0.1 seconds. Maximum response times occasionally increased significantly under concurrent conditions, though 100 concurrent users exceeds peak-period usage, meeting platform requirements.

Table 5 Platform Stress Test Results

Function	Test Cases	Avg Response Time (ms)	Max Response Time (ms)
Reading Resources	1,000	58	210
Writing Resources	1,000	63	225
Appointment Query	1,000	49	185
Appointment Processing	1,000	55	198
Consultation Query	1,000	48	180
Consultation Processing	1,000	56	205
Assignment Query	1,000	50	190
Assignment Processing	1,000	59	215

4.3 Browser Compatibility Testing

Browser compatibility significantly impacts user experience. We tested main front-end and back-end pages using mainstream browsers: IE11, Firefox, Chrome, and 360 Safe Browser. Results are shown in Table 6 . All four browsers could open main pages, with Firefox and Chrome having the fastest page loading speeds and IE11 the slowest—particularly for back-end pages, which somewhat affects user experience. 360 Safe Browser performed moderately.

Table 6 Browser Compatibility Test Results

Browser	Test Cases	Avg Response Time (ms)	Max Response Time (ms)
Firefox	100	42	75
Chrome	100	40	73
IE11	100	68	125
360 Safe Browser	100	55	95

4.4 Platform Usage Effectiveness

Since its launch in April 2017, the platform has implemented functions including reading and writing resource browsing, student appointment scheduling, question submission, and assignment submission, receiving positive feedback from both instructors and students. The platform averages 1,000 daily visits: reading resources average 350 visits/day, writing resources 420 visits/day, question submissions average 12/day, and assignment submissions average 7/day.

5 Issues and Prospects

The construction of the Southwest Jiaotong University Reading and Writing Center network platform has played an important role in cultivating students' reading and writing abilities. However, in practice, we believe the platform has room for further improvement and refinement:

1. **Basic Resource Construction**: Existing learning resources should be more comprehensive, covering not only undergraduates but more academic levels.
2. **Resource Sharing**: Strengthen resource co-construction and sharing with relevant university units, such as integration with the academic affairs course selection system and campus network center student information systems.
3. **Departmental Collaboration**: Enhance resource co-construction and sharing with school departments to build richer university-specific characteristic resources.
4. **User Interaction**: Teacher-student interaction modules need greater diversity and humanization with better user experience, such as using online assessments to identify individual weak areas and pushing corresponding courses, resources, and instructors.

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