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Xinqing Ark — A University Psychological Counseling Platform Empowered by SpringBoot+Vue Dual-End Architecture

Luo Xiuping[1,a], Luo Jianhua[1,b,*], Huang Xian[1,c], Yang Meijing[1,d], Liu Wei[1,e], Ma Yubo[1,f]

[1]School of Information Engineering, Guilin University, Guilin, Guangxi, China
[a]3191663633@qq.com, [b]1306254580@qq.com, [c]3509129471@qq.com, [d]1303273564@qq.com, [e]2870802310@qq.com, [f]1778913772@qq.com
**Corresponding author*

Abstract: *To address challenges in university mental health education counseling such as spatial-temporal constraints, resource fragmentation, and lack of personalization, the "Xinqing Ark" Intelligent Psychological Counseling Platform has been designed and implemented. This platform integrates intelligent, user-friendly, and personalized services through a Spring Boot + Vue front-end back-end separation architecture, leveraging Java technology and MySQL database for core development. It achieves dual compatibility for PC and mobile devices while establishing a permission-based smart service system for students, teachers, and administrators. The platform incorporates core functionalities including psychological assessments, intelligent scheduling, feedback messaging, test analysis, and mental health knowledge bases. Vue enables highly interactive front-end interface design, while Spring Boot ensures efficient backend processing. The dual-platform approach makes psychological counseling services readily accessible, significantly enhancing the digitalization and intelligence levels of university mental health education. This initiative establishes a comprehensive psychological safeguard system for college students.*

Keywords: *Psychological intelligence counseling, SpringBoot framework, Vue, Front-end and back-end separation, Dual-platform compatibility, University mental health*

1. Overview

With the digital transformation of campuses, college students face multiple mental health challenges such as academic pressure, employment anxiety, and social adaptation difficulties [1]. Traditional offline counseling is limited by fixed hours, spatial constraints, privacy concerns, and inefficient resource allocation, while PC-only systems fail to meet mobile and fragmented usage needs.

To address these issues, the "Xinqing Ark" university psychological counseling platform was developed using Spring Boot+Vue with a front-end back-end separation architecture, enabling dual-end empowerment for both PC and mobile. Centered on intelligent services, precise guidance, privacy protection, and efficiency, the platform offers students 24/7 psychological assessments, online appointments, messaging, and knowledge learning. For educators, it provides automated test analysis, streamlined appointment management, and student data tracking. Administrators benefit from comprehensive resource allocation and granular permissions. Named "Xinqing Ark," the platform symbolizes a safe vessel for students to relieve psychological distress and nurture positive mental health.

2. Introduction to Related Technologies

2.1 Spring Boot Framework

SpringBoot is a lightweight rapid development framework based on Spring, following the convention-over-configuration design concept with core features such as auto-configuration, starter dependencies and embedded servers. It simplifies the complex configuration of traditional Spring projects, reduces repetitive code, and greatly improves development efficiency and maintainability[2]. In this platform, SpringBoot acts as the core backend framework to build stable and efficient RESTful API

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services, responsible for request processing, business logic, database interaction and permission verification; its embedded Tomcat supports fast deployment, and its good compatibility and scalability facilitate later function iteration. The platform's SpringBoot-based backend architecture is shown in Figure 1, which clearly shows the interaction process from client requests to business processing and data storage, reflecting the stability and efficiency of the backend system.

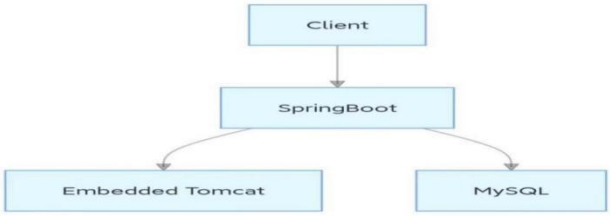

Figure 1: Spring Boot Backend Architecture Diagram.

2.2 Vue Front-end Framework

Vue is a lightweight, high-performance progressive JavaScript framework featuring component-based and responsive design. It supports component reuse and nesting to efficiently develop and maintain user interfaces, and can be integrated with Vue Router, Vuex and Element UI to implement routing, state management and interactive interface construction. This platform adopts Vue as the front-end development framework, which realizes the adaptive display of desktop and mobile terminals, improves development efficiency through componentization, and ensures a good cross-device user experience. The Vue-based front-end architecture of the platform is shown in Figure 2, which presents the complete front-end technical system including routing, state management and UI components, ensuring consistent display and interactive experience across devices.

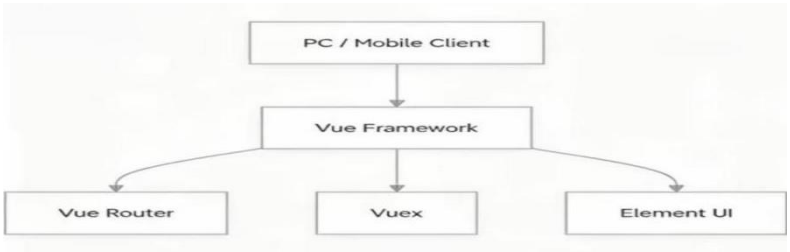

Figure 2: Vue Front-end Architecture Diagram.

2.3 Front-end and back-end separation architecture

The front-end back-end separation architecture is mainstream in modern web development. The front-end uses Vue and communicates via AJAX/axios to Spring Boot APIs, while the back-end provides standardized services. Figure 3 illustrates this architecture, showing the decoupling between Vue and Spring Boot and API-based data interaction. This decoupling of development, deployment, and maintenance enables parallel team work, boosts efficiency, supports cross-platform adaptation (desktop/mobile), reuses back-end interfaces, reduces costs, and ensures scalability.

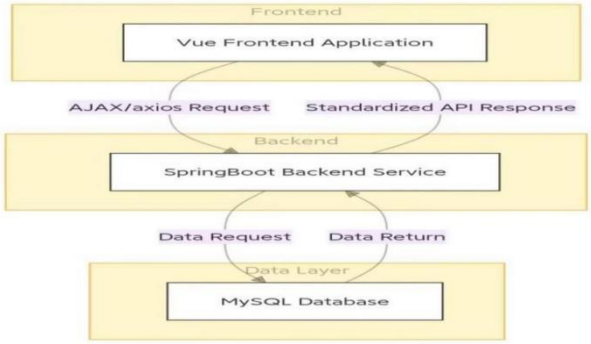

Figure 3: Vue + Spring Boot Front-end and Back-end Separation Architecture Diagram.

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2.4 Java Technology and MySQL Database

Java offers security, portability, and scalability, making it a mainstream backend language. This platform uses Java with Spring Boot for efficient, stable cross-server operation. Figure 4 presents the three-tier architecture (presentation, application, data layers), making the structure clear and maintainable. MySQL, an open-source relational database with fast performance and low cost[3], stores structured data such as user info, assessment questionnaires, appointment records, feedback, and knowledge bases. Through table partitioning and join queries, it enables standardized storage and efficient operations, while its permission management and data backup ensure data security, integrity, and stability.

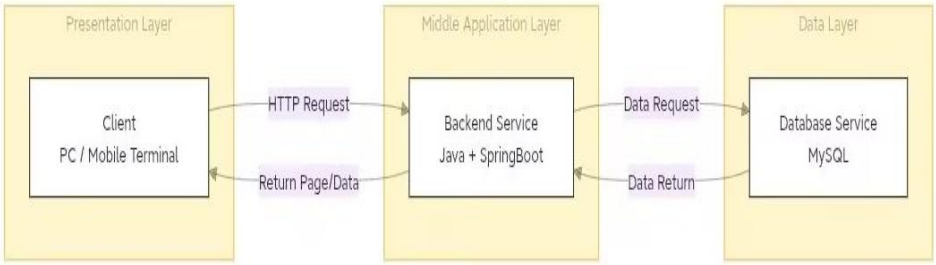

Figure 4: Three-tier Architecture Diagram of the System.

2.5 Bidirectional Adaptation Technology

This platform leverages Vue's responsive layout and adaptive design principles, integrating front-end technologies such as media queries and elastic layouts to deliver seamless cross-device functionality. The interface automatically adjusts its layout and element dimensions based on screen sizes across devices, ensuring consistent user experience on computers, smartphones, and tablets. It also streamlines mobile operations to accommodate students' fragmented and mobile usage patterns, making psychological counseling services readily accessible anytime, anywhere. The flowchart of the bidirectional adaptation technology is displayed in Figure 5. It shows how responsive layout and elastic layout realize cross-device adaptation for PC and mobile.

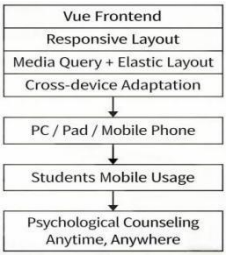

Figure 5: Bidirectional Adaptation Technology Flowchart.

3. System Requirements Analysis

3.1 Functional Requirements

This platform adopts a student-centric approach with teacher support and administrator oversight, featuring a permission hierarchy for seamless PC and mobile experience. The functional module composition of the Xinqing Ark Mental Health Platform is shown in Figure 6, which includes six core modules that work together to form a complete psychological service system.

The User Management Module handles registration, login, profile maintenance, role-based permissions, and cross-device synchronization. The Psychological Assessment Module allows teachers/admins to publish questionnaires; students complete them online with auto-scoring and result generation. The Smart Tutoring Appointment Module enables students to request appointments, tutors to approve/reject, and admins to manage overall records.

The Message Feedback Module supports anonymous or named posts with private responses from teachers/admins. The Mental Health Knowledge Base Module lets teachers/admins publish articles and

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videos; students browse and bookmark materials. The System Management Module gives admins full control over users, tests, appointments, messages, knowledge base, and system configurations to ensure platform stability.

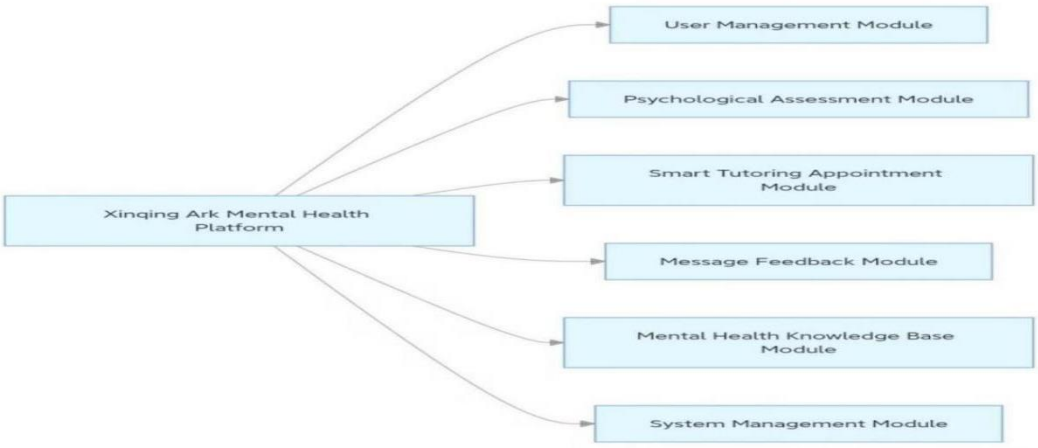

Figure 6: System Functional Module Diagram.

3.2 Non-functional requirements

To meet students' habits and counseling needs, the platform defines strict non-functional requirements for a safe, seamless cross-device experience. Performance: page response ≤2 seconds, 100 concurrent users, 100% interface success. Security: encrypted storage of sensitive data accessible only to teachers/admins, with protection against SQL injection and XSS. Usability: clean, intuitive interfaces on PC and mobile, no training needed. Compatibility: PC supports Chrome, Edge, Firefox; mobile supports iOS and Android. Scalability: modular design for future additions like intelligent recommendations. Stability: 24/7 operation, cross-device access, transactional integrity, rapid anomaly recovery.

3.3 System Architecture Design

The platform adopts a three-tier architecture with front-end back-end separation, fully decoupling the presentation, business logic, and data access layers. This enables dual-end support for PC and mobile, improving maintainability, scalability, and development efficiency. The three-tier architecture with front-end back-end separation is depicted in Figure 7, which integrates these layers with clear technical boundaries. The presentation layer is built with Vue and Element UI for PC, Vant UI for mobile, using Axios to communicate with backend APIs. The business logic layer, based on Spring Boot and Java, handles core operations such as user authentication, permissions, assessments, and appointments, providing standardized RESTful APIs. The data access layer uses MyBatis to interact with MySQL, handling data operations and ensuring consistency and integrity.

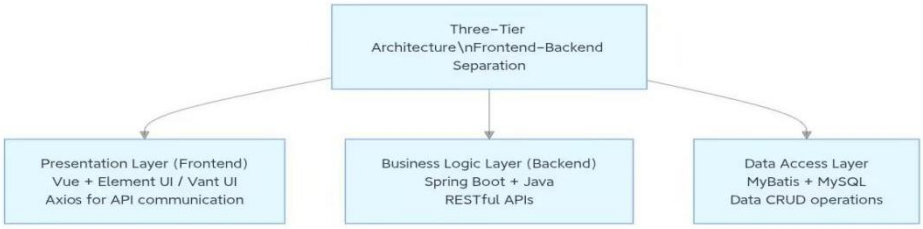

Figure 7: System Three-tier Architecture Diagram with Front-end and Back-end Separation.

3.4 System Feasibility Analysis

The system features a clean, intuitive interface that is easy to operate—users can access all needed information after login, and administrators require only basic literacy and logical reasoning. It uses free development tools and can be fully developed, maintained, and upgraded on a single computer, making

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development costs near zero. All technical documentation complies with legal standards, with no intellectual property or copyright issues, and no plagiarism of other systems. Thus, the system is operationally, economically, and legally feasible.

4. Overall System Design

4.1 Overall Functional Module Design

Based on the vision of "dual-end empowerment and intelligent counseling," the Xinqing Ark platform consists of six core modules: user management, psychological assessment, intelligent tutoring appointment, message feedback, knowledge base, and system administration. These modules work together with data interoperability across PC and mobile to form a comprehensive counseling ecosystem.

User Management handles identity, roles, and cross-device login. Psychological Assessment supports test release, auto-grading, and result analysis. Intelligent Appointment lets students select tutors, teachers review requests, and administrators allocate resources.

Message Feedback enables anonymous messaging and private student-teacher communication. Knowledge Base allows publication of mental health resources for self-help learning. System Management gives administrators full control over all platform data and operations.

4.2 Core Business Process Design

The platform's core business processes are designed around students' fundamental needs, ensuring seamless integration between PC and mobile interfaces. Here are the three key business process designs:

The Intelligent Psychological Assessment Process relies on the System Management Module, centrally operated by administrators, enabling comprehensive management of all platform data and resources for normal, stable, and efficient operation. The Intelligent Tutoring Appointment Process allows students to select instructors, time slots, and consultation types on PC or mobile and submit requests. The backend stores the request and notifies instructors, who review and accept or reject with comments. Results sync to students for real-time tracking, while administrators monitor all bookings, handle anomalies, and optimize resource allocation.

5. Database Design

This platform utilizes a MySQL database[3], adhering to normalized design principles for its architecture that separates front-end and back-end components while supporting dual-platform functionality. It defines core entities including administrators, students, teachers, examination papers, and test questions, with their interrelationships visualized through E-R diagrams. The system establishes essential data tables such as users, students, examination papers, and appointments to ensure standardized data storage, while maintaining real-time synchronization and data consistency across both platforms.

5.1 Database Entities (E-R Diagram)

An E-R diagram is a visual data description method used to represent relationships between entities, which can intuitively map real-world data connections and support database design by standardizing data structures and entity associations. It clearly shows entity attributes and their dependencies, helping to clarify primary-foreign key relationships and improve data organization and analysis efficiency. This system uses E-R diagrams to define core entities: Figure 8 shows student attributes including basic and contact information; Figure 9 presents the data model of psychological assessment papers with attributes such as title and duration; Figure 10 describes teacher information for appointment and data management; and Figure 11 defines administrator attributes like username and password to support permission control and identity authentication.

These E-R diagrams systematically illustrate the attributes and associations of students, examination papers, teachers, and administrators in the university psychological counseling system. By standardizing entity attributes and their relationships, they provide a clear data structure foundation for system development and data management, while supporting reasonable data classification and effective business logic implementation.

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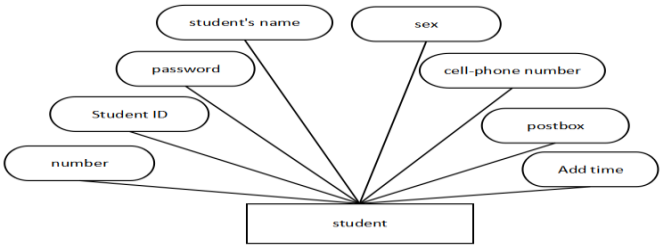

Figure 8: E-R Diagram of Student Entity Attributes.

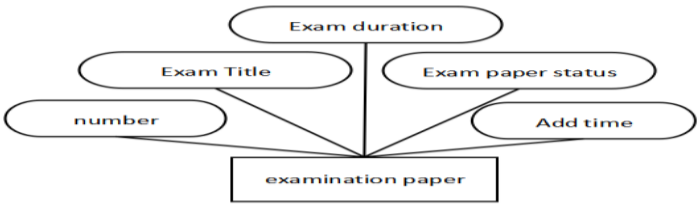

Figure 9: E-R Diagram of Exam Paper Entity Attributes.

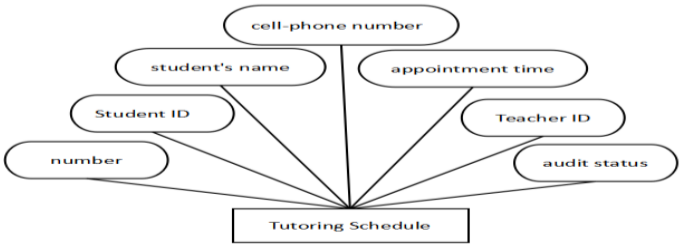

Figure 10: Diagram of Teacher Entity Attributes.

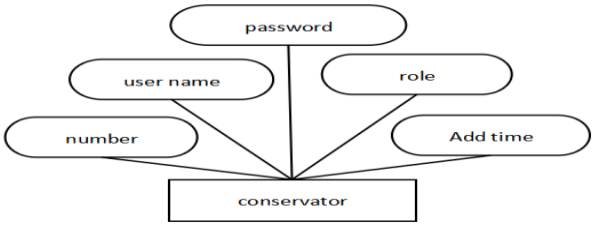

Figure 11: E-R Diagram of Administrator Entity Attributes.

5.2 Core Database Entities and Association Relationships

The core database entities include administrator, student, teacher, exam paper, test question, tutoring appointment, feedback message, and knowledge base. The E-R diagram of these entities and their relationships is illustrated in Figure 12, which shows one-to-many and many-to-many associations. Specifically, a teacher or administrator can publish multiple test papers, following a one-to-many relationship. A test paper contains multiple questions, also a one-to-many relationship. Students and teachers have a many-to-many relationship through tutoring appointments, and similarly through message feedback interactions. A teacher or administrator can publish multiple knowledge base materials, again following a one-to-many relationship.

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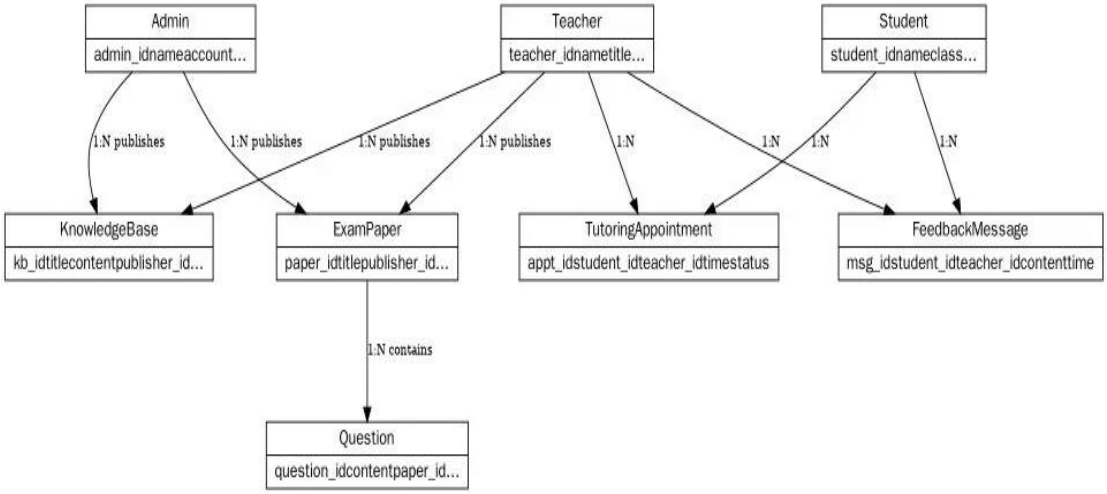

Figure 12: E-R Diagram of System Core Database Entities and Relationships.

5.3 Core Data Table Design

The platform design includes multiple core data tables to enable categorized storage of various data types. Below is a detailed explanation of the core data table design, with field configurations that balance cross-platform data interaction and business requirements.

Table 1 is the Administrator Information Table (users), which stores login credentials and basic information for system administrators. As the core component of platform permission management, this table features an ID field as the primary key to uniquely identify each administrator, username/password fields for login authentication, and role fields to specify access permissions, ensuring that only authorized personnel can access backend management functions.

Table 1: Administrator Information Form

field name	data type	Is it empty?	Field Meaning
id	bigint(20)	NOT NULL	number
username	varchar(100)	NULL	user name
password	varchar(100)	NULL	password
role	varchar(100)	NULL	role
addtime	timestamp	NULL	Add time

Table 2 is the Student Information Table (students), which stores detailed profiles of the platform's core service recipients—students. The table uses student_id (student ID) as the unique business identifier for each student, combined with the password field for login authentication. It also records contact details such as name, gender, phone number, and email address, providing essential information support for functions like tutoring appointments and message responses.

Table 2: Student Information Form

field name	data type	Is it empty?	Field Meaning
id	bigint(20)	NOT NULL	number
student_id	varchar(200)	NULL	Student ID
password	varchar(200)	NULL	password
name	varchar(200)	NULL	name of student
gender	varchar(200)	NULL	sex
phone	varchar(200)	NULL	cell-phone number
email	varchar(200)	NULL	postbox
addtime	timestamp	NULL	Add time

Table 3 is the Examination Paper Information Table (examination_paper), designed to manage test resources in the psychological assessment module. The name field records the test title, the duration field specifies the exam length (in minutes), the status field indicates test availability status (e.g., enabled or disabled), and the addtime field documents the publication date. This table is linked with the Question Table to form a complete psychological assessment system.

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Table 3: Test Paper Information Table

field name	data type	Is it empty?	Field Meaning
id	bigint(20)	NOT NULL	number
name	varchar(200)	NULL	Exam Title
duration	int(11)	NULL	Exam duration
status	int(11)	NULL	Exam paper status
addtime	timestamp	NULL	Add time

Table 4 is the tutoring appointment table (appointment), which records appointment information between students and teachers. The table associates students with teachers through the student_id and teacher_id fields, with appointment_time recording the scheduled time. The audit_status field tracks the approval status of appointments (e.g., pending review, approved, rejected), enabling digital management of the tutoring appointment process.

Table 4: Guidance Appointment Schedule

field name	data type	Is it empty?	Field Meaning
id	bigint(20)	NOT NULL	number
student_id	varchar(200)	NULL	Student ID
student_name	varchar(200)	NULL	name of student
phone	varchar(200)	NULL	cell-phone number
appointment_time	timestamp	NULL	appointment time
teacher_id	varchar(200)	NULL	Teacher ID
audit_status	varchar(200)	NULL	audit status

The four aforementioned tables represent the core data structures of the platform. Additionally, the platform has designed specialized data tables including questionnaires (question), feedback forms (message), and mental health knowledge databases (knowledge) to meet data storage requirements for psychological assessments, online communication, and knowledge dissemination. These data table designs not only fulfill current operational needs but also provide a robust data foundation for future functional expansions, such as incorporating more complex psychological assessment dimensions or implementing evaluation systems for psychological counselors.

6. Main Functional Implementation of the System

The system utilizes Spring Boot and Java technologies for backend development, employs MySQL for data storage, and adopts a B/S architecture for frontend access. Its core functionality implements three major role modules: students, teachers, and administrators. Below is a detailed explanation of the key functional modules:

6.1 Implementation of Student Function Modules

The Student Module is the core front-end component, offering login, psychological testing, tutoring appointments, and feedback. The login interface validates student ID and password, with backend verification via Spring Boot. Upon successful login, users enter the main dashboard. The test paper list shows available assessments. Clicking "Exam" opens the online examination interface, which tracks time and auto-submits for grading. The tutoring appointment interface allows form-based input and instructor selection. Submitted requests are stored in MySQL pending teacher review.

6.2 Implementation of Teacher Function Module

The teacher module supports psychological counseling and test management, including personal info maintenance, test result analysis, appointment review, and mental health data publication. After login, teachers view appointment requests, approve or reject them, with results synced to students in real time. The test analysis interface displays all students' scores and response records, allowing teachers to add insights for subsequent counseling. This process, drawing on [1], uses IT to improve mental health management, enabling teachers to more accurately monitor students' psychological dynamics.

6.3 Implementation of Administrator Function Module

The administrator module serves as the core backend management system, enabling comprehensive

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data and user administration. It supports operations including student and teacher information management (addition, deletion, modification, and querying), centralized review of tutoring appointment records, unified administration of exams and test questions, and message board management. Upon login, administrators gain full system privileges: they can maintain all user profiles, delete inappropriate comments and invalid appointment records, publish system announcements, update mental health learning materials, and ensure smooth system operation.

7. System Testing

To ensure the functional integrity, stability, and security of the system, this approach combines black-box testing with white-box testing. System testing is conducted across three dimensions: functional testing, performance testing, and security testing, to verify whether the system meets all metrics specified in the requirements analysis.

Function testing uses black-box testing to verify all core modules for three user groups, with no functional defects or logical errors, meeting functional requirements. Performance testing shows page response time within 3 seconds and support for 50 concurrent users, thanks to Spring Boot and optimized MySQL, meeting performance requirements.

Security testing confirms strict permission isolation, encrypted password storage and protected student psychological data, eliminating leakage risks. Overall, the system is stable, user-friendly and meets the practical needs of university psychological education counseling.

8. Conclusion

This study uses Spring Boot, Java, MySQL, and B/S architecture to design a university psychological counseling system. It addresses limitations of traditional offline counseling [4], with role-based permissions for students, teachers, and administrators, covering psychological testing, appointments, feedback, and data management. The system features user-friendly interfaces, strong security, and scalability. It integrates network technology with mental health education, improving service efficiency and accessibility, and providing confidential channels for students. Future enhancements can add real-time consultations, course modules, and data visualization using Spring Boot [5].

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