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«БИР ПОЯС – БИР ЖОЛ» ДЕМИЛГЕСИНИН АЛКАГЫНДА КЫРГЫЗСТАНДАГЫ ОНЛАЙН БИЛИМ БЕРҮҮ ПЛАТФОРМАСЫНЫН СИСТЕМАСЫН ИЗИЛДӨӨ ЖАНА ИШКЕ АШЫРУУ

Аннотация. "Бир белок, бир жол" демилгесинин тереңдетүүсүндө, Борбордук Азиядагы билим берүүнүн санариптик трансформациясы Кытайдын жана Кытайдын гуманитардык алмашууларын тереңдетүү жана өндүрүштүк кубаттуулуктун кызматташтыгын өнүктүрүү үчүн маани Жібек жолунун экономикалык аймагындагы маанилүү түйүн катары Кыргызстанда билим берүү ресурстарынын тең эмес бөлүштүрүлүшү, сапаттуу окутуучулардын жетишсиздиги, санариптик инфраструктуранын алсыздыгы сыяктуу оор көрсөткүчтөрү узак убакыт бою жогорку билим берүүнүн жеткиликтүүлүгүн жана сапатын чектейт. Бул макалада булут эсептөө, микросервистер, жасалма интеллект жана ачык булактуу технологияларды колдонуп, Кыргызстандагы онлайн билим берүү платформасынын системасын изилдөөлөр жүргүзүлгөн. Бул платформа булуттук эсептөөгө негизделген, кытай, орус, англис жана кыргыз тилдерин алмаштырууну колдойт. Изилдөөлөр көрсөткөндөй, булутка негизделген онлайн билим берүү платформасы Кытайдын эки тараптын билим берүү ресурстарын натыйжалуу интеграциялоого мүмкүнчүлүк берет жана "Бир белок, бир жол" боюнча өлкөлөргө көчүрүлүп, жайылтылууга болот.

Негизги сөздөр: Бир пояс-бир жол, Кыргызстан, булут эсептөө, онлайн билим берүү, Микро кызматтар.

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ИССЛЕДОВАНИЕ И РЕАЛИЗАЦИЯ СИСТЕМЫ ОБРАЗОВАТЕЛЬНЫХ ОНЛАЙН - ПЛАТФОРМ КЫРГЫЗСТАНА В КОНТЕКСТЕ «ПОЯСА И ПУТИ»

Аннотация. На макроуровне непрерывного углубления инициативы «Один пояс и один путь» цифровая трансформация образования в Центральной Азии стала важной отправной точкой для углубления китайско - кыргызских гуманитарных обменов и содействия сотрудничеству в области производственных мощностей. Кыргызстан как важный узел экономического пояса Шелкового пути, неравномерное распределение образовательных ресурсов, нехватка высококачественных учителей, слабая цифровая инфраструктура и другие болезненные моменты в Кыргызстане долгое время ограничивали охват и качество высшего образования, срочно необходимо добиться справедливости и качества образования через онлайн - образовательные платформы. В этой статье всесторонне используются облачные вычисления, микросервисы, искусственный интеллект и технологии с открытым исходным кодом, вокруг исследования системы платформы онлайн - образования Кыргызстана в контексте «Пояса и пути», разработан и реализован набор онлайн - образовательных платформ, ориентированных на национальные условия Кыргызстана. Платформа основана на облачных вычислениях, поддерживает переключение четырех языков на китайском, русском, английском и кыргызском языках, предлагает прямые уроки, адаптивное обучение, анализ обучения и другие функции. Исследования показывают, что онлайн - образовательная платформа, основанная на облачных вычислениях, может эффективно интегрировать образовательные ресурсы Китая и Кыргызстана и предоставить странам вдоль «Пояса и пути» копируемую и масштабируемую «китайскую программу».

Ключевые слова: Пояс и путь, Кыргызстан, Облачные вычисления, Онлайновое образование, Микросервисы.

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RESEARCH AND IMPLEMENTATION OF AN ONLINE EDUCATION PLATFORM SYSTEM IN KYRGYZSTAN UNDER THE BELT AND ROAD INITIATIVE

Abstract. In the macro context of the deepening of the "the Belt and Road" initiative, the digital transformation of education in Central Asia has become an important starting point for deepening people to people and cultural exchanges and promoting productivity cooperation between China and Kyrgyzstan. As an important node on the Silk Road Economic Belt, Kyrgyzstan has long been constrained by pain points such as uneven distribution of educational resources, shortage of high-quality teachers, and weak digital infrastructure, which have hindered its higher education popularization rate and quality. It is urgent to achieve educational equity and quality improvement through online education platforms. This paper comprehensively uses cloud computing, microservices, artificial intelligence and open source technology, and focuses on the research of online education platform system in Kyrgyzstan under the background of the "the Belt and Road", to design and implement an online education platform for Kyrgyzstan's national conditions. This platform is based on cloud computing and supports switching between Chinese, Russian, English, and Kyrgyz languages. It provides features such as live classes, adaptive learning, and learning analysis. The research shows that the online education platform based on cloud computing can effectively integrate the education resources of both China and Kyrgyzstan, and provide the countries along the "the Belt and Road" with replicable and promotable "China solutions".

Keywords: The Belt and Road Initiative, Kyrgyzstan, Cloud computing, Online education, Microservices.

1. Research background and significance

1.1 "the Belt and Road" Initiative and Digitalization of Education

Since it was put forward in 2013, the "the Belt and Road" initiative has moved from "freehand brushwork" to "fine brushwork", and the digital Silk Road has become an important fulcrum. In 2020, the "the Belt and Road" Digital Economy International Cooperation Initiative listed "online education cooperation" as one of the priority actions. The COVID-19 has further amplified the demand for cross-border digital education. China's mature MOOC, live classroom, AI adaptive learning and other technologies need to be implemented and transformed in Central Asia.

1.2 Educational Challenges and Opportunities in Kyrgyzstan

Although 1877 schools in Kyrgyzstan have been connected to the Internet, the gap between urban and rural education is still significant due to low bandwidth, high fees and lack of digital content in mountainous areas. At the same time, the government of Kyrgyzstan is promoting the national strategy of "Education Digitalization 2025-2030", planning to invest 120 million US dollars in teacher ICT training and digital platform construction. With the deepening of economic and trade cooperation between China and Kyrgyzstan, there is a shortage of over 50000 Chinese+vocational skills talents, providing a clear market demand for online education. In 2023, the Malaysian government released the "2024-2028 Education Digitalization Strategy", which clearly proposes the construction of a "National Education Cloud" and an "Online Credit Recognition Platform". At the same time, under the framework of the "the Belt and Road Initiative", China has successively aided the construction of "Luban Workshop" and "Central Asia Digital Institute", which urgently need a sustainable online education platform system.

1.3 Research significance

Academic value: fill in the gap of systematic research on the national online education platform of the "the Belt and Road" southbound channel [1];

Practical value: Exporting Chinese online education technology standards and content ecology, achieving the goal of "teaching people how to fish" [2];

Humanistic value: With education as the link, deepen mutual trust between Chinese and Jilin youth, and consolidate the social foundation of people to people communication [3].

2. Literature Review and Theoretical Framework

2.1 Current Research Status at Home and Abroad

Foreign literature mainly focuses on the evaluation of distance education policies and infrastructure in Central Asia, while domestic research mostly focuses on online cooperation cases with Russia and ASEAN, lacking practical research for Kyrgyzstan.

2.2 Theoretical Basis

Educational equity theory: emphasizes narrowing regional disparities through technological compensation [1];

Technology Acceptance Model: Explain the willingness of teachers and students to adopt online platforms [2];

Knowledge Construction Community Theory: Supporting Collaborative Teaching and Research among Chinese and Jilin Teachers and Co creation of Multilingual Content [3].

3. Requirements Analysis

3.1 Policy and Regulatory Environment

The current Education Law of Kyrgyzstan does not clearly define the recognition status of academic qualifications in distance education, leading universities to adopt a wait-and-see attitude towards online credit conversion. In February 2024, the Ministry of Education and Science of Jilin Province issued the "Interim Management Measures for Digital Education", which for the first time allowed universities to award degrees in a hybrid mode, providing a policy window for platform implementation.

3.2 Pain points of demand

Hardware: Insufficient 2G/3G signal coverage in mountainous areas, and outdated mobile terminals;

• Software: Lack of low bandwidth adaptation apps, existing platforms are mainly in Russian;

• Content: Chinese and vocational skills micro courses are scarce

4. Detailed Design of Kyrgyzstan's Online Education Platform System

This system adheres to the system design goals of low investment cost, flexible expansion, simple maintenance, complete functionality, and configurable services during the design and development process.

4.1 Functional module design

This system combines the design of teaching business and processes in the process of scientific teaching, and provides more comprehensive services based on users' different roles. This system mainly includes two management modules: users and resources, two teaching modules: learning tasks and communication interaction, and a public information module. As shown in Figure 1.
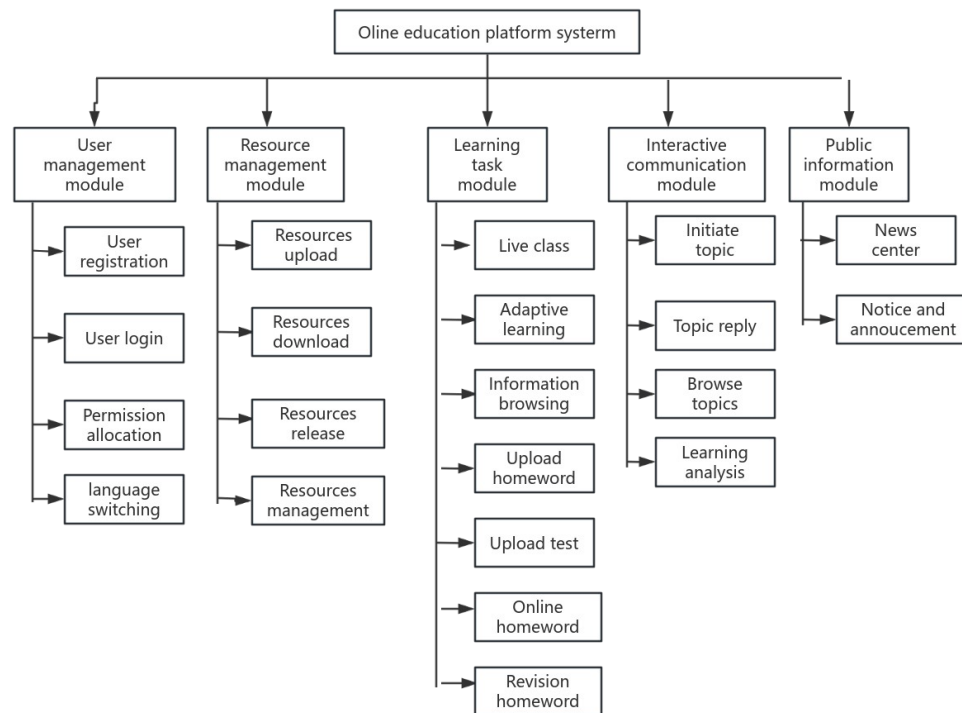
Figure 1, System Function Diagram

User management. The users in this system mainly include teachers, students, and administrators. The user management module can ensure that users can access and operate the system legally. The main functions include user login, user registration, permission allocation, and language switching [1, 6].

Teaching resource management module. This module is designed in combination with different functional requirements arising from different system user roles. The main functions of this module include uploading teaching resources, downloading resources, publishing resources, and managing resources [2, 5].

Learning tasks. In the process of online education, the main learning tasks are achieved through testing or homework. The main functions of this module include live classroom, adaptive learning, information browsing, uploading homework, uploading tests, online homework, grading homework, etc. Based on user roles, for college students, online education mainly includes information browsing, homework submission, and online answering tasks. As for teachers, learning tasks mainly include homework construction, task publishing, task uploading, online grading, and answer sheet setting [3, 8].

Interactive communication module. Interactive communication and answering questions cannot be separated from the forum section. The main functions are as follows: initiating topics, responding to topics, browsing topics, and learning analysis. The functions of the interactive communication module can be more consistent with the psychological demands of college students, so as to effectively stimulate their interests and improve their learning efficiency.

4.2 Database Module Technology

The system's core data tables are as follows:

User Management Table. This table stores detailed basic information of all users and underpins the functions of user registration and login [1].

Teaching Resources Table. This table contains fundamental teaching-resource data, enabling users to search, browse, and download materials [2].

Online Learning Tasks Table. Tasks in the online-learning process mainly consist of online assignments and online quizzes. All relevant task information—task details, question information, and student profiles—is stored in this table; teachers upload tasks to the system, and students submit them for online grading. This structure effectively supports online testing, online assignments, and teachers' online uploading and grading [3, 7].

Interactive Discussion Table. Leveraging a forum structure, this table preserves all user-posted content, supporting comments, replies, and follow-up posts to facilitate rich communication and discussion [4, 5].

5 Implementation and Testing of the Online Education Platform System in Kyrgyzstan
5.1 Detailed System Implementation
5.1.1 Development Environment Setup

The system is primarily built with Java as the development language, utilizing the MyEclipse IDE and its key plug-ins. All functional objectives are achieved using the specified Java SDK version.

5.1.2 User Management Module

When users run the system, they can enter their credentials directly on the login page, supplying their username and preset password. The system recognizes these inputs and allows immediate access. Users may then submit requests using their username and password. The system queries the configuration file and forwards the login request to LoginAction for processing. Additionally, users can switch languages as needed.

5.1.3 Learning Task Module

In this module, functionality varies according to the user's role. Instructors can upload and grade assignments directly through the system, while students can complete and submit homework online and immediately view their scores. When an instructor enters the assignment section, the system retrieves the various types of tasks the instructor has configured and displays them in a list; clicking a link triggers the corresponding operation. The instructor's workflow for publishing an assignment is as follows: use the provided controls to upload the task, process the request, save the task's metadata, process the next request, save the answer-sheet template, process the request to save the publishing record, save the record, and finally process the publish request. For tests or homework that students have already completed and submitted, the instructor can grade them directly, entering a score based on each student's work and the correct answers. The grading workflow is: issue the grading request, process the request, query the student's answers and the correct answers, finish grading and submit the score, accept the processing request, and save the instructor's feedback. The student's online-task workflow is: log in, enter the learning task, review the task content, check whether it is already finished, decide whether to answer online, submit, and view the score.

5.1.4 Teaching Resources Module

This module is divided by role: students search for and download teaching resources, whereas instructors publish them. The instructor's publishing workflow is: upload the resource via the provided control, process the file's metadata, and handle the publish request (see Figure 2). The student's search-and-download workflow is: initialise the search criteria, query for teaching resources that satisfy the criteria, return any results as a paginated list for display, and—if resources exist—process the download request using the resource path; otherwise, the process ends. By

implementing these two key functions, the platform gives full play to learner autonomy, raises instructional efficiency, reduces instructors' workload, and enhances students' initiative and learning ability.
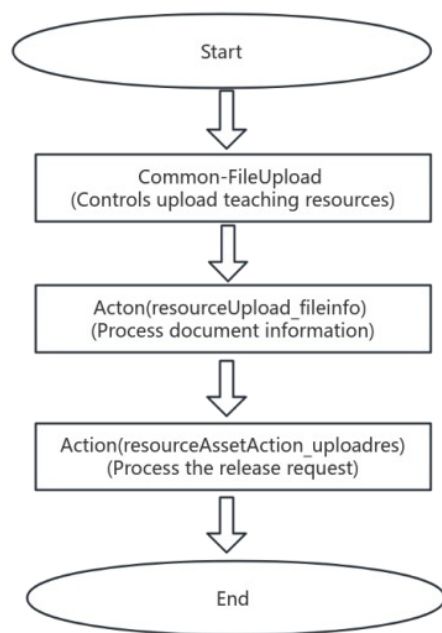

Figure 2, Flowchart of Instructor Resource Publishing

5.1.5 Interactive Discussion Module

The interactive discussion module mainly supports posting new threads, browsing their contents, and replying to comments. The workflow for a user to create a post is as follows:

1. Initialize the "Add Topic" page.

2. Use the page to fill in the post content and set its metadata.

3. Receive the parameters and process the "Save Post" request.

4. Persist the post content.

Specifically, when the user issues a request to create a new post, the system processes the request and initializes the posting page. The user then uses the new-topic page to enter the subject and other essential information, submits the save request to the designated handler, and the system invokes the model-layer method `saveLpost()` to store the detailed post information in the database.

The workflow for users to search and browse posts is:

1. Initialize search criteria.

2. Query for threads that meet the criteria.

3. If results exist, return them as a paginated list to the page for display; otherwise, terminate.

4. Use the thread ID to query and display the detailed content of the selected post.

5.2 System Testing

Testing focused on the system's core functional modules:

1. User Login

On the login page, enter the username and password and click "Login." Testing confirmed that the user is taken directly to the personal dashboard, meeting the design expectations.

2. Information Update

Navigate to the "Personal Information" page, complete the form, and save. Testing verified that all updated user information is correctly persisted, fulfilling the design goal.

3. Online Answering

A student logs in, clicks "Online Assignment," selects an unfinished task, completes it, and submits. Testing confirmed that the student can successfully finish and submit the homework, and the instructor promptly receives it, satisfying the expected outcome.

In summary, the project successfully designed and implemented a cloud-based online education platform. Through rational design and rigorous testing, the system delivers multiple functions, effectively integrates educational resources between China and Kyrgyzstan, and meets all anticipated requirements.

6 Conclusion and Prospect

The online education platform system of Kyrgyzstan in the context of the "the Belt and Road" proposed in this paper has successfully solved the "last mile" problem of digital education in Kyrgyzstan's mountainous areas, with low bandwidth multilingual technology, co building and sharing content ecology, and public welfare+business operation mode as the core. Through reasonable design and scientific testing experiments, multiple functions were ultimately achieved, effectively integrating educational resources from both China and Kyrgyzstan, and meeting the expected design effects and needs.

Future work will:

Deepen the integration with China's "National Smart Education Platform" and achieve greater resource sharing on a larger scale [1];

Explore personalized learning paths based on AI to improve learning efficiency [2];

Copy the experience to neighboring countries such as Tajikistan and Uzbekistan to form a Central Asian digital education community [3].

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