



Design and Research of Economics Online Learning Platform Based on Java Language Environment

Lei Lin¹

¹*Dalian University of Finance and Economics, Dalian, Liaoning, China*
hello_219@163.com

Abstract

Based on the Java language development environment, this paper takes Sakai CLE version 2.8.1 as the basic framework, selects appropriate functional components and related data API interfaces, and completes the construction of online learning platform of economics network with a feasible secondary development design form. With the help of the application advantages of network information technology, aiming at the difficulties and shortcomings in the current teaching process of economics courses in colleges and universities, this paper puts forward systematic and comprehensive solutions from the aspects of teaching contents, teaching forms, interactive communication and assessment. The construction of the platform not only conforms to the learning habits of contemporary college students, stimulates students' learning autonomy, but also effectively assists teachers to complete daily teaching tasks and improve teaching efficiency. For colleges and universities, the development and application of online learning platform is in line with the development requirements of the current "Internet + education" era, and it is an escort for cultivating economic talents for building a socialist modernization power.

Keywords: *Sakai System; Java; Economics; Online Learning Platform*

1 INTRODUCTION

Since the 18th National Congress of the Communist Party of China, China has entered a new era of development in an all-round way. With the deepening of economic reform, the adjustment of regional industrial structure and the transformation of growth power, it is the current and future direction to gradually promote high-quality economic and social development. China adheres to the economic model with market economy as the main body, and strives to build a socialist market economic system with Chinese characteristics. In the face of the reform and development of the economic system, we need to follow the economic laws, and we need a large number of economic talents who know investment, finance, foreign trade and macroeconomic management, and invest in the government, market and enterprises to handle the relationship among them. Therefore, colleges and universities should be aware of the changes in the demand of economics talents in the current society in advance, and adjust the teaching mode and talent training plan of economics courses according to the actual situation. So as to achieve the goal of cultivating innovative and research-oriented talents with a solid foundation in economics, international vision and

feelings of home and country, mastery of modern econometric analysis technology, economic thinking mode and the ability to expand and penetrate into related fields of economics for the whole society [2].

As far as the current situation of economics teaching in colleges and universities is concerned, the training target has been changed to "after 00", and the number has increased year by year. Under the huge educational pressure, the shortcomings of the current economics teaching mode in colleges and universities have been highlighted. Problems such as single teaching content, lack of teaching resources, outdated teaching forms, and lack of individual differentiated teaching have become the crux of influencing the teaching effect of economics education. In addition, the discipline construction of economics is also in the stage of reform and innovation, and it is also the key stage of the discipline system construction of economics with Chinese characteristics. At present, the main content of economics teaching in colleges and universities is mainly western economics, and its theoretical framework and system can't explain all kinds of phenomena in China's economic development, let alone guide the country's future economic development. For college students in the new era, only by studying Chinese economics with socialist economic

thoughts with Chinese characteristics in the new era can we truly and correctly understand the development law of economy with Chinese characteristics, grasp the new development stage, and contribute to promoting the high-quality development of regional economy and building a modern economic system [10]. In view of this, this paper holds that in the internet plus era, with the help of the application advantages of network information technology and the Web application as the carrier, an online learning platform of economics in colleges and universities was constructed, and a systematic and comprehensive solution was put forward for the development of current economics education and teaching practice. Based on the actual application needs of students and teachers on the platform, Sakai system is adopted as the basic framework, and the feasible secondary development design forms are used to complete the digitalization and virtualization of daily learning process. Moreover, the platform has social attributes, which can effectively enhance the communication and interaction between students and teachers, and fully realize the reform of teaching form. At the same time, relying on the advantages of centralized processing of data and information on the network platform, it can update and enrich the teaching contents and resources, and provide the necessary foundation for students' individualized learning and differentiated development. In addition, the network online teaching platform can provide a good supplement to the traditional classroom teaching, not only help to improve the teaching effect of economics, but also play a role in assisting daily teaching, and further promote the process of information reform of higher education, making contributions to the discipline construction of economics with Chinese characteristics.

2 INTRODUCTION OF KEY TECHNOLOGIES

2.1 Java

Java usually stands for a general purpose, class-based and object-oriented programming language, and it is also the general name of Java development platform. Java was born in 1995. As the only programming language that can complete dynamic interactive programs in the Internet environment at that time, it quickly gained the favor of developers, and its application scope was greatly expanded. Then JDK1.0 released in 1996 officially marked the birth of the integrated development platform of Java language. Under JDK1.0, it includes the Java Runtime Environment (JRE) and the Java Development Kit (JDK). The runtime environment includes five parts: core API, integration API, user interface API, publishing technology and Java virtual machine (JVM). The development environment is mainly a compiler that compiles Java programs [7]. The emergence of development platform provides the necessary programming environment and corresponding auxiliary tools for the development of Java software or application programs, which can quickly complete the compilation, interpretation, document generation, packaging and other operations in the development process, so as to achieve the purpose of improving work efficiency.

Java language is the medium that programmers use to communicate with computing. The process of expressing specific requirements and assumptions by Java language is the process of realizing functions by Java programming language. Java language needs to go through several stages from basic code to complete the function execution of the whole application, including compilation, class loading, bytecode verification, interpretation and running. The overall process is shown in Figure 1. First, the Java code is compiled and converted into byte code, and the Class. file is generated. Then, it is loaded by JVM through Class loader for security check. The interpreter interprets the Class. file as machine code. Finally, the Runtime in the running environment runs the code to realize the corresponding functions.

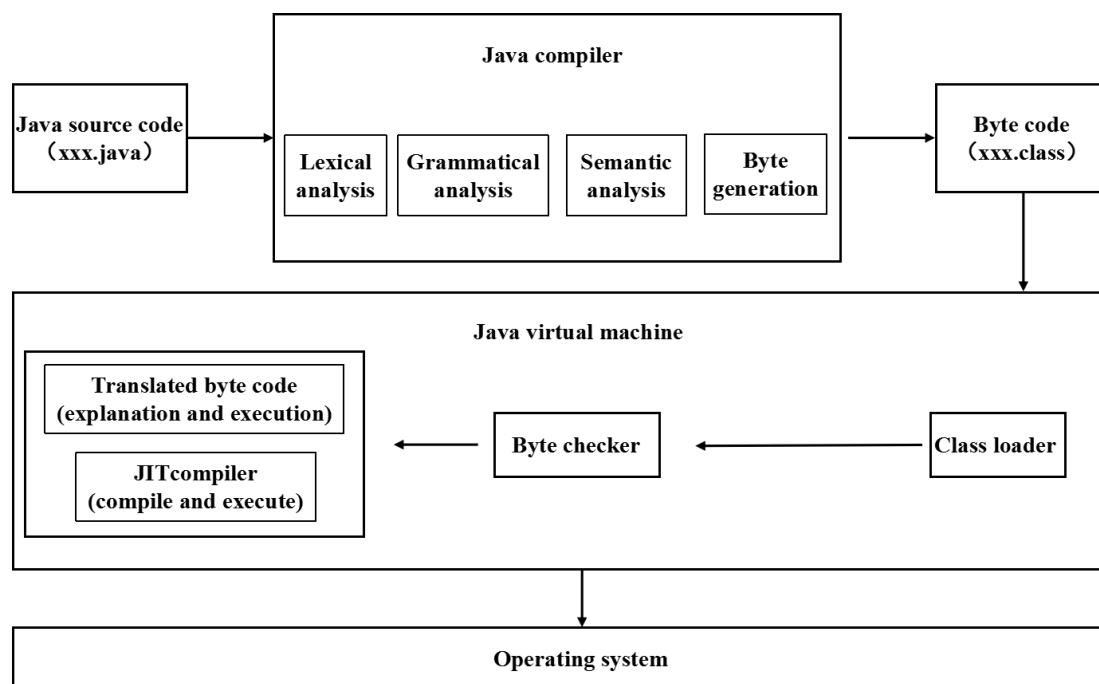


Figure 1: Execution flow chart of Java code

Then, in the development of Java language, JSP/Servlet technology, EJB and other specifications are highly centralized and unified gradually, and JavaSE, JavaEE and JavaME systems are formed. Among them, JavaSE contains all kinds of basic syntax and application class libraries of Java language, which is mainly used for the design and development of graphical user interfaces in the Internet environment, and the construction of desktop applications with complex logic and high performance requirements. As an enterprise development version, JavaEE has obvious portability, robustness, scalability and security compared with JavaSE. And it has completed a series of definitions of Web services, component models, management and communication APIs, which can be used to realize enterprise-level service-oriented architecture (SOA) and Web 2.0 applications [4]. The service object of JavaME is mobile devices or other embedded devices, which provides a flexible and safe running environment for applications.

Today, Java has become the first choice of more than 9 million developers because of its simplicity, object-oriented, distributed, robustness, security, platform independence and portability, multi-threading and dynamics. At the same time, with the use of Struts, Spring and Hibernate, the structure can be simplified in the actual development process, the coupling degree between codes can be reduced by layered thought, the reusability of codes can be improved, the operation and maintenance cost of the system can be reduced, and the running speed of application programs can be improved.

2.2 Sakai system

Sakai is a web-based open source system architecture, which can be integrated with various developed CMS tools and components to form a free, open source and powerful teaching management software. The application of Sakai system can infinitely expand the time and space of teaching and learning, improve the learning and teaching efficiency, not only benefit the course management, but also benefit the expansion of the original module tools, support group collaboration and research cooperation, manage knowledge, and realize information resource sharing, teacher-student interaction, independent learning, collaborative learning and research, online learning and blended learning [6].

The kernel of Sakai system is developed based on J2EE framework. As shown in Figure 2, Sakai, as a lightweight J2EE Servlet container, has a strict hierarchical structure. Including presentation layer, tool set, service layer, API service interfaces or components at all levels, etc. As the core application of Sakai system, service and application function determine the application scope and height of the system. Common system services include security authentication service, tool set management, website service, session management, file content service, etc. As for the actual application functions of Sakai system, some of them come from the preset, and secondary development based on the source code is also supported to expand new applications and add new functional modules. Sakai system, with its powerful service items and functional applications, can widely adapt to the current education and teaching mode in colleges and universities, and has

established curriculum management systems and online learning platforms for many colleges and universities.

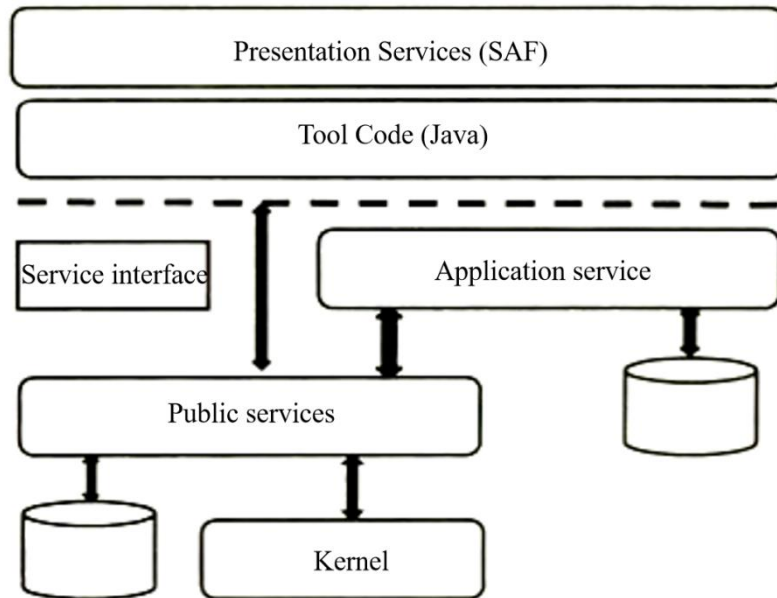


Figure 2: The J2EE framework for Sakai

2.3 Secondary development of the Sakai system

The objects of secondary development of Sakai system are mainly aimed at various tools, and they can be added to Sakai system in the form of plug-ins to complete the operation. Therefore, the secondary development of Sakai system is also called Sakai system plug-in technology [1].

The secondary development of Sakai system needs to go through four stages: tool creation, project directory setting, tool configuration integration and tool release. Among them, in the tool creation stage, Sakai AppBuilder plug-in is needed, which allows developers to use Eclipse or MyEclipse to complete the design and development of tool application projects in the Java development language environment. In the project

directory setting stage, newly developed tool plug-ins will abide by all directory structures of Sakai system functional modules. A complete directory structure is not only the standard for secondary development, but also provides necessary guarantee for the compatibility and running stability of subsequent tool plug-ins [8].

After the detailed design of the tool plug-in, system platform integration is required, that is, the source code of the tool plug-in is deployed in the /tools directory, and the tool is determined by the unique identification ID. The key code is shown in Figure 3. In the final release stage of the tool, it is necessary to add the corresponding monitoring or control class library under the Web.xml file to ensure the successful completion of the initialization of relevant parameters when the tool is started.

```

<?xml vesion="1.0" encoding="UTF-8"?>
<registration>
  <tool id>="Sakai. sturegister"
  title-"sturegister"
  <description="sturegister created by Sakai App Builder Plugin">
  <category name="course"/>
  <category name="project"/>
</tool>
</registration>
  
```

Figure 3: Integration configuration key code for the Sakai tool

2.4 Development environment

According to the system development requirements and the use requirements of the above key technologies, we have completed the configuration and deployment of the development environment. The overall development of the online learning platform of economics is based on Linux operating system, with CentOS 6.3 X86_64 and Sakai system version 2.9, Java as the basic development environment, JDK version 7 and above, and Eclipse 4.3_64 as the integrated development tool. The Web server is Apache Tomcat 7.0, and the database is MySQL 5.7.

During the design and development of Sakai system, Maven is used to download and compile the code dependency packages. This system chooses Maven3.2.2. In the actual application process, in Eclipse, first create a new Maven Project, complete the setting of the corresponding project name, version and Java package name, and then adjust the configuration under pom.xml file, including Tomcat server configuration, MySQL database settings, etc. After that, the Jar package of Sakai system is deployed to the newly-built Webapp under Eclipse to complete the import of the source code.

As for the secondary development of Sakai system tool plug-ins, it supports the integration of various tool plug-ins into Sakai in the form of Java webapp. The method is to add metafiles (tool.xml), add some parts to the web.xml of the project, and you can choose to load CSS/JS in the header file and use Java to access the API of Sakai kernel [3]. Through the introduction of the above key technical theories, we have determined the overall environment of the system development, the configuration of related software and tools, and the technical feasibility of the overall project of the network learning platform for construction engineering management.

3 REQUIREMENTS ANALYSIS

3.1 System requirements analysis

The online learning platform of economics will be guided by JavaWeb application development thought, aiming at cultivating economic talents for building a powerful socialist country with modernization, aiming at

the shortcomings existing in the current teaching practice of economics in colleges and universities, and combining with the new demands of the new era construction of economics, it will put forward innovative reform practice paths. It makes a new attempt to promote the reform of economics teaching mode in colleges and universities, and to further improve the education system in colleges and universities.

The platform will support users with different roles, teachers and students, to apply for account registration by submitting materials, log in and use the system with unique identification information, and complete the corresponding permission allocation and management according to the platform application requirements of different user roles. Among them, student users have the right to use multiple functional modules, such as personal data management, course study, schedule management, resource expansion, homework and testing, interaction and answering. For teachers, the design of functional modules focuses more on the management and control of courses, and the main functions include: site management, course management, notification management, resource management, homework management, examination management, and interaction and answering.

3.2 Global design

The online learning platform of economics will be designed based on Sakai system platform, adopt B/S architecture, and complete the overall design and development with MVC mode in Java language environment. The overall architecture depends on the implementation of Spring and Hibernate framework under J2EE specification [5]. The overall structure model of the platform is shown in Figure 4. According to the requirements of demand analysis, the online learning platform of economics is simply divided into five sections. They are student user section, teacher user section, teaching management section, resource management section and learning assistance support section. In order to meet the needs of students' autonomous learning, the platform can provide rich tools for independent selection and use. These tools can well support students' autonomous learning, and at the same time greatly help teachers to complete daily education and teaching practice, and improve teachers' work efficiency.

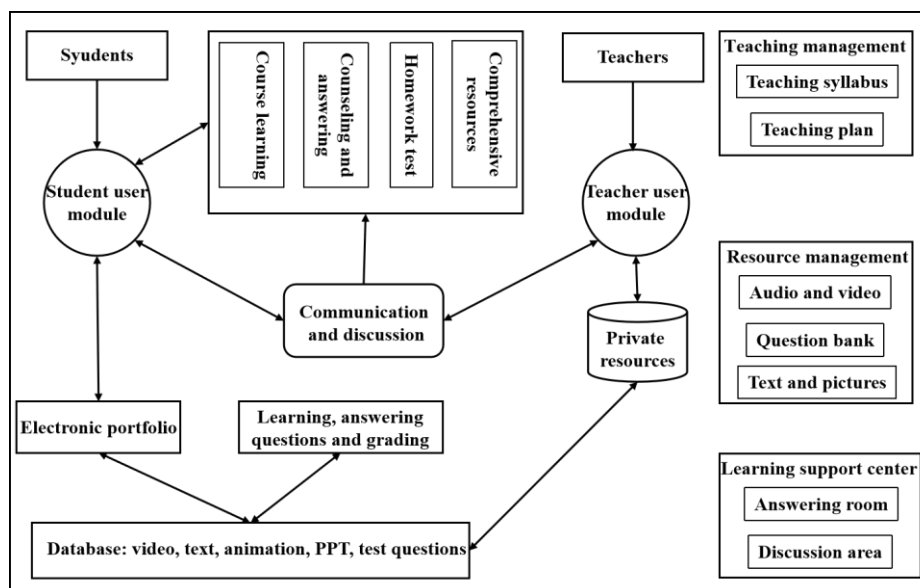


Figure 4: System overall architecture diagram

4 DETAILED FUNCTION IMPLEMENTATION

4.1 Student side

The Sakai framework is used to construct the online learning platform of economics, which has many functional modules on the student side, such as personal data management, schedule management, course learning, resource expansion, homework and examination, interaction and question answering. Among them, the course learning function is the core function module of students' independent choice of economics teaching resources and completion of learning.

When the student user logs in the system through the unique account number and password verification, they can apply for and join the economics-related courses under the course learning function module. After joining the relevant courses, the information of students will be updated automatically and synchronized to the teacher's side to form a class or group, so as to facilitate the teacher's subsequent teaching management. Then, the syllabus, teaching plan, teaching notice and other information of this course will be automatically displayed under the schedule management module. It is helpful for students to know the teacher of the course in advance, the information of class arrangement and various activities organized after class, to grasp the course learning progress in time, and to adjust their learning behavior, so as to finally achieve autonomous learning.

The main contents of the course include video teaching courses based on massive open online course, such as conventional courses such as "Economic Principles" and "Macroeconomics", and New jieyou, China's Political Economy, China's Development

Economics, which are combined with China's economic development examples. The online teaching platform has effectively solved the shortage of teaching content and resources in the current teaching process of economics, and has become a necessary supplement to traditional classroom teaching.

Under the function module of expanding resources, all kinds of teaching resources have to be classified and stored systematically, so that students can consolidate and learn repeatedly. Including classroom teaching resources, that is, some PPT, written materials, test questions and so on used by offline teachers in classroom teaching. Materials are all kinds of massive open online course videos of online classroom teaching content. The expanded materials include more comprehensive and open materials. For example, documentary "Master of Economics", film "The Wolf of Wall Street", e-books "Wealth of Nations" and "Capital" can greatly facilitate students' access to excellent resources outside textbooks and improve their learning efficiency.

Under the module of homework and examination, the system not only supports students to finish homework online and submit it, but also obtains teachers' corrections in time. It can also realize the organization, implementation and evaluation of online examinations, and promote students' mastery of professional knowledge under the complete educational process. The final interaction and question answering function belongs to the learning support center of the system, and the question answering room and comment area are effective ways to strengthen the communication and interaction between students and teachers. On the one hand, it can facilitate students to get targeted guidance from teachers in time, on the other hand, it can build a good learning atmosphere and enhance the humanity of online learning.

4.2 Teacher side

Compared with the functional design of student side, teacher side pays more attention to the guidance, supervision and control of online teaching activities of economics courses. When teachers log in to the system, they can first complete the creation, setting and publishing of economics-related courses under the course management. At the same time, all kinds of learning resources supporting the course will be uploaded and maintained. However, Sakai system's support for video resources is relatively simple, and it can't meet the requirements of accessing and reading a large amount of video resources in high frequency and high concurrency. Therefore, this system will use RSF (Rational Server

```
@Listen("onUpload=#fileUpload")
public void upFileResource(UploadEvent evt) {
    org.zkoss.util.media.Media media = evt.getMedia();
    String fileName = media.getName().toLowerCase();

    Desktop dtp = Executions.getCurrent().getDesktop();
    String realPath = dtp.getSession().getWebApp().getRealPath(relativePath);
    InputStream reader = media.getInputStreamData();
    File file = new File(realPath + fileName);

    try {
        file.createNewFile();
    } catch (IOException e) {
        e.printStackTrace();
        return;
    }

    try {
        Files.copy(file, reader);
    } catch (IOException e) {
        e.printStackTrace();
    }

    Files.close(reader);
}
```

Figure 5: Key code of video file uploading function

5 CONCLUSIONS

The construction of the online learning platform of economics can aim at various problems existing in the current teaching practice of economics, and with the help of the application advantages of network information technology and the mature functional application of Sakai system, it can complete the digitalization and virtualization of daily learning process, and fully realize the reform of teaching form. The system can fully meet the needs of current universities, teachers and students in the process of economics education and teaching, and can form a joint force with classroom teaching. It can effectively improve the teaching effect, and at the same time, it also pays more attention to the individualized and differentiated cultivation of talents, and effectively promotes the process of information-based reform of higher education, making contributions to the discipline construction of economics with Chinese characteristics.

Faces) development framework in the Lessonbuilder component under Sakai system to complete the secondary development of video tools, as shown in Figure 5, uploading key codes for video files [9]. Teachers can add and call video processing tools to upload, delete and play video resources under site management. Secondly, during the course, teachers are mainly responsible for the assignment and marking of homework, and the organization and implementation of tests. Finally, after class, teachers will also be able to participate in the Q&A room and comment area to help students answer questions, and at the same time, they will be able to know the current situation of students' study in time.

REFERENCES

- [1] Chen Liang, Shen Liyan (2019). Construction and Application of Open Course Platform Based on Sakai. Software Guide (Educational Technology).06.
- [2] Chen Yuanqing, Li Jing, et al (2021). Exploration on the Teaching Reform of Economic Basic Platform Course Based on the Cultivation of Innovative Talents-Taking the Teaching of Western Economics as an Example. Journal of Mudanjiang College of Education.10.
- [3] Ji Guoxue (2018). Research on the Application of Sakai Network Teaching Platform in Tennis Teaching in Colleges and Universities. Henan Normal University.05.
- [4] Ke Cai (2020). Research on Web Application Based on J2EE and MVC Pattern. Computer engineering & Software.03.

- [5] Luo Tingjin, Zhuang Honglin (2013). The Basic Structure and Building Method of Sakai Teaching Platform. Journal of Yunnan Nationalities University: Natural Sciences Edition.06.
- [6] Luo Tong (2017). Design and Implementation of MOOC Learning Platform Based on Sakai. Xiamen University.10.
- [7] Liu Xuehua (2021). Characteristics and Technology Exploration of Computer JAVA Programming. Technology Wind.08.
- [8] Su Weiqiang (2019).Design and Implementation of Network Excellent Course Management System Based on Sakai.Xiamen University.06.
- [9] Zhao Lei (2015). Design and Implementation of Learning Resource Management Assistant Tool Based on Sakai Platform. Henan Normal University.04.
- [10] Zhou Wen, He Yuqing (2022).Characteristics of Western Economic Discourse and the Construction of China's Economic Discourse System. Journal of Shandong University (Philosophy and Social Sciences).01.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

