

Exploration and Practice of Online Open Courses Based on JavaEE Framework Technology

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Abstract: With the booming development of web technology, the position of JavaEE framework technology courses in software engineering is becoming increasingly important. This article focuses on the goal of constructing online open courses using JavaEE framework technology, starting from the construction of online teaching resources, and introduces the specific plan for constructing online open courses using JavaEE framework technology. This course is offered after the JavaWeb course. After learners master the basic knowledge of web development, through the study of the JavaEE Framework Technology course, they will master the basic methods of using framework technology to achieve software development, thereby training students to comprehensively apply their ability to develop web projects. This can enable learners to better adapt to the needs of enterprises after graduation.

1. Introduction

The JavaEE framework technology course is a key practical course for software engineering majors and is currently a popular web development technology widely used. The proportion of software development positions recruited by companies is also increasing, and many universities regard this course as a mandatory course for senior students majoring in software engineering to meet the needs of the company. ^[1]

This article proposes a BOPPPS hybrid project-based teaching model based on the Chaoxing Cloud platform, which involves teaching reform and research from the selection and reconstruction of teaching content, innovation of teaching methods, teaching assessment and evaluation, etc. It explores a student-centered innovative teaching model, reforms the previous "teaching oriented" teaching concept, and establishes a "learning oriented" teaching concept, Enhance students' interest in learning and their awareness of practical application and innovation ^[2]. To achieve the "three facilitation", that is, to promote the establishment of students' self knowledge system, to promote the formation of systematic learning methods, to facilitate the formation of students' comprehensive practical application ability and innovative system analysis and design ability, and to integrate new knowledge and new technologies into practice, cultivating applied talents that are more in line with market demand ^[3].

2. Research purpose and significance

As an enterprise level application development of Java, Java EE is increasingly widely used in the field of software development technology. Java EE holds a large proportion in software development recruitment and is a very important employment direction: with a wide range of employment areas, multiple employment options, and high employment salaries^[4]. JavaEE is currently one of the most popular enterprise level web application development technology systems. JavaEE framework technology is a practical and comprehensive course organized by senior students majoring in software engineering at our school. The course requires students to master at least one framework technology to develop web systems^[5]. The research objectives and significance of this course are mainly reflected in the following aspects:

Improving Education Quality: By studying the JavaEE framework technology, we can continuously optimize course design, enrich course content, improve teaching methods, and ultimately enhance education quality, cultivating more talents with practical application abilities.

Cultivating talent for enterprise needs: As a mainstream development platform, there are also more and more talents mastering Java EE. Introducing JavaEE framework technology in the course can help students better understand and apply advanced development technologies, enhance their competitiveness, and better meet the needs of enterprises.

Enhancing student employment competitiveness: By learning JavaEE framework technology, students can master a mainstream development technology and have more job opportunities. Meanwhile, students with this technological ability will also be more competitive in the job market.

Promoting disciplinary development: The research and development of JavaEE framework technology in online open courses can promote the development of related disciplines, including software development, database management, network communication, etc. At the same time, it can also promote interdisciplinary integration and promote collaborative innovation among multiple disciplines.

Promoting industrial upgrading: With the continuous development of JavaEE framework technology, it has become the preferred platform for many enterprises to conduct business development. Therefore, research on online open courses of JavaEE framework technology can not only cultivate more talents, but also promote the upgrading and transformation of the industry.

3. Basic research content

The course combines the characteristics of undergraduate students majoring in software engineering with the current needs of information technology teaching, and provides a blended project-based teaching model reform based on the Chaoxing Cloud platform^[6]. At the same time, project-based learning (PBL) and case-based teaching methods were adopted for organizational design, allowing every student to participate in the implementation of the design and unleashing their subjective initiative. The basic content of course research includes several aspects.

3.1 Align with the job requirements of enterprises and clarify course objectives

Through extensive enterprise research and market demand investigation, the course teaching team formulated a training plan after professional research. According to the training objectives, the course teaching objectives were formulated based on the knowledge, skills, and quality requirements of industry professional positions, as shown in Table 1. Based on feedback from previous graduates, the course has clarified the career direction and skill requirements, as well as the knowledge and skill objectives of the course. Furthermore, the vocational skill requirements have been taken as the course objectives, as shown in Figure 1, making them more closely aligned

with the vocational skill requirements^[7].

Table 1: Teaching Objectives of the Course

Course aims	Knowledge aims	1) Familiar with the basic process of software development
		2) Familiar with building and using Java EE applications and development environment (Idea+Tomcat+MySQL)
		3) Familiar with JSP/Servlet development technology
		4) Understand the MVC and layered architecture ideas
		5) Master the principles and applications of Spring framework technology
		6) Master the principles and applications of Mybatis framework technology
		7) Master the principles and applications of SpringMVC framework technology
		8) Master the integration and application of Mybatis, SpringMVC, and Spring framework technologies
	Ability aims	1) Can access relevant technical documentation and manuals
		2) Ability to complete software project development through team collaboration
		3) Able to analyze and troubleshoot various errors and exceptions encountered during software development
		4) Able to adopt software engineering concepts and methods to design and implement enterprise level application software projects
		5) Be able to correctly write and manage various technical documents during software development process
	Quality aims	1) Has good communication and expression skills, and a team spirit of cooperation
		2) Having good cultural literacy and cultivation
		3) Having cultural confidence and patriotism
		4) Having good psychological qualities, strong willpower, and the courage to overcome difficulties
		5) Having strong physical fitness and adapting to work needs
6) Having a solid business foundation and the ability to continuously innovate and surpass oneself		

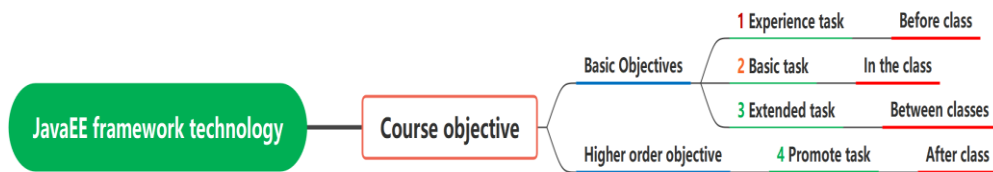


Figure 1: Course Objective Plan

3.2 Update course content around course objectives

In the process of course content construction for "JavaEE Framework Technology", combined with the characteristics of Dongguan's economic development, the opinions of course backbone teachers and technical experts in the industry were collected and organized, focusing on the core goal of cultivating applied talents in WEB software development and emphasizing the cultivation of students' innovative thinking and practical skills[8].

3.3 Improve student learning efficiency, reform teaching methods, means, and models

During the teaching process, the "Chaoxing Learning Platform" was utilized to carry out reforms and explorations of blended online and offline teaching modes. The course uses "Chaoxing Learning Pass" as a tool to increase the interaction between teachers and students, make the classroom atmosphere lively and relaxed, and improve the quality of classroom teaching by pushing courseware, previewing knowledge points through videos, communicating with teachers and providing timely feedback on questions, scanning and signing in with mobile phones during class, and engaging in online interactions such as selecting students, practicing in class, voting, and answering questions, as shown in Figure 2.

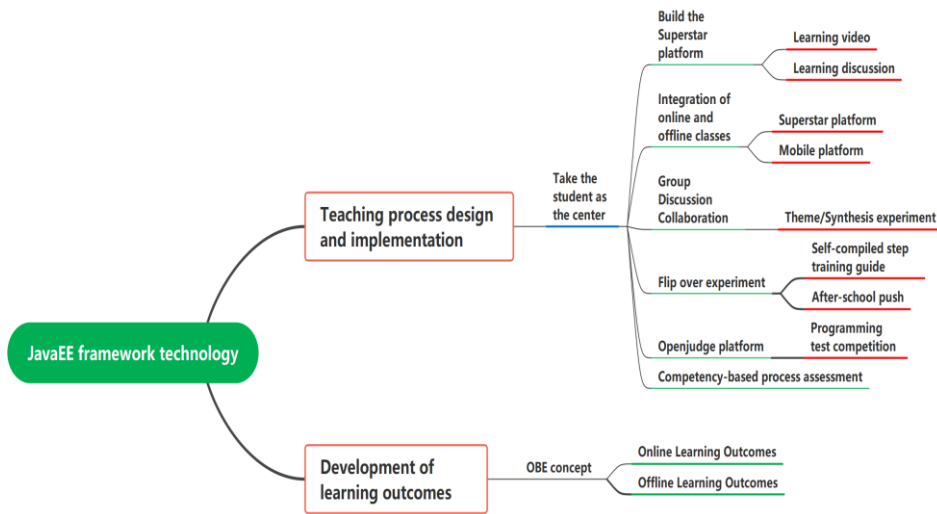


Figure 2: Learning outcomes and teaching process design

Various teaching methods such as teacher lectures, teacher demonstrations, student demonstrations, and student exercises are used to enhance students' hands-on and innovative abilities. Learning resources such as courseware, lesson plans, exercises, and test questions are uploaded to the course website to achieve high-quality teaching resource sharing, as shown in Figure 3. At the same time, the teaching process includes pre class material preparation, in class teaching, post class interactive discussion and Q&A, content testing, and extended learning. The classroom teaching process follows the BOPPPS teaching mode.

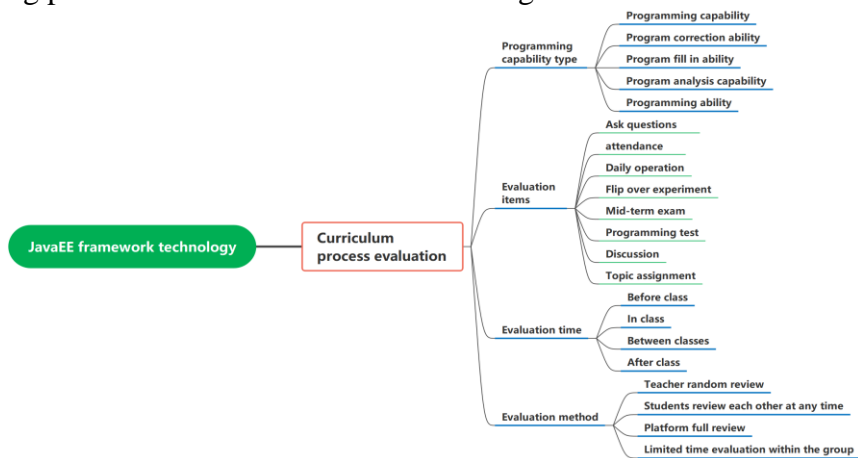


Figure 3: Process based evaluation design

3.4 Improve the effectiveness of course teaching and enrich course resources

After years of construction, the course has diversified its course resources, including basic teaching resources such as course syllabus, lesson plans (course unit design), practical training guides, multimedia courseware, homework library, test question library, and case library. There are also teaching videos recorded by the main teacher for knowledge points, practical application project introductions, and complete program demonstrations, as shown in Figure 4. Relying on the "Chaoxing Learning Platform", all course resources are online, establishing an interactive space that integrates teaching content, online discussions, Q&A, homework assignments, sharing of teaching resources, and online testing and training. Students can choose and use relevant teaching resources anytime and anywhere on their own.

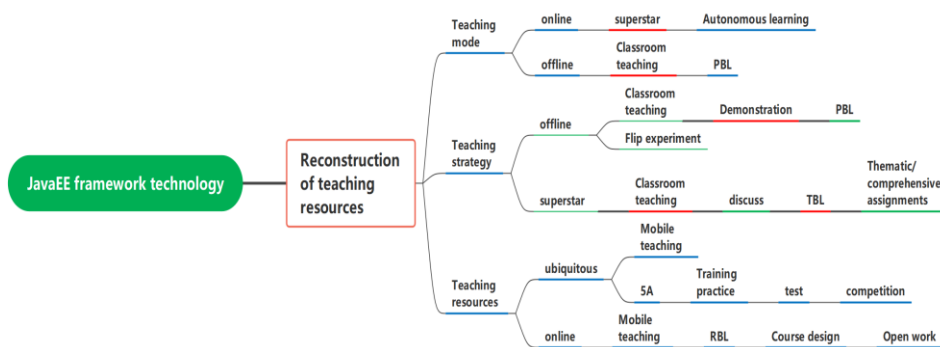


Figure 4: Reconstruction of teaching resources

3.5 Update the teaching level of course team teachers and optimize the course team

The team consists of experienced professors in teaching and research, as well as young and middle-aged teachers who are innovative and hardworking^[9]. At the same time, the teaching team actively implements the "old leads new" plan, encourages and leads young teachers to training and practice in enterprises, and participates in various subject competitions, in order to strengthen and promote the training of young teachers. The team collaborates and discusses with each other during the teaching process, continuously improving teaching ability and research level, and has won high praise from students.

3.6 Implementing the concept of "cultivating virtue and nurturing talents" and integrating ideological and political elements into the curriculum

Course ideological and political design mainly involves exploring the ideological and political elements in professional courses and integrating them into the teaching process of the course. Through the design of course ideological and political education through courses and teaching methods, the specific design is shown in Figure 5.

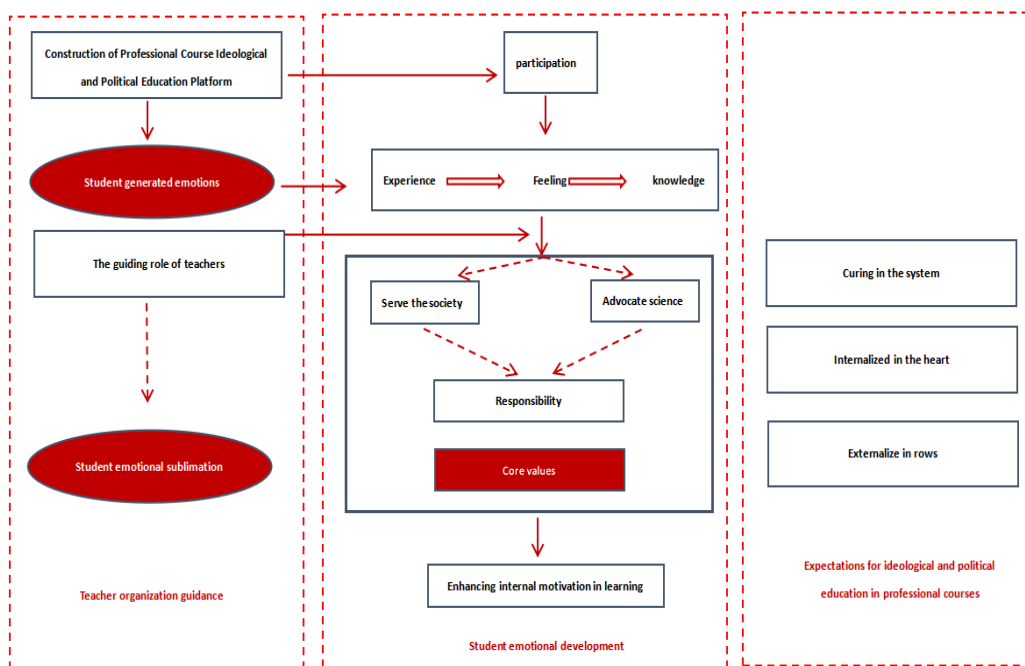


Figure 5: Design of Course Ideological and Political Education

Starting from six aspects: computer culture, cutting-edge disciplines, technological self-improvement, independent innovation, critical thinking, and craftsmanship spirit, ideological and political education helps cultivate seven comprehensive abilities of students, including active participation, exploration awareness, and collaborative win-win. From four directions: subject competitions, research and education integration, project research and development, and school enterprise cooperation, we aim to help achieve the high-level goals of the curriculum and achieve its "high-level" nature, as shown in Figure 6. By integrating ideological and political education into the curriculum, we aim to cultivate students who serve society and emphasize the core values of scientific social responsibility and responsibility.

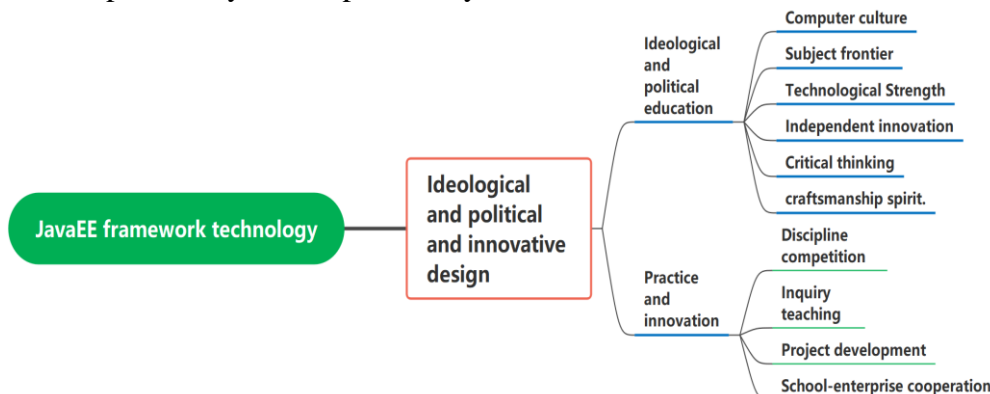


Figure 6: Ideological and Innovative Design

4. Research ideas and methods

The implementation process of this course mainly includes the organization and implementation of three stages: pre class, in class, and post class. The teaching implementation process is shown in Figure 7. The course design adopts the OBE concept combined with educational objectives, subject nature, and student needs, ensuring that while imparting technical knowledge, students are trained in thinking, innovation, and teamwork abilities, and emphasizing ideological and political education through case analysis, group discussions, project cooperation, and other methods.

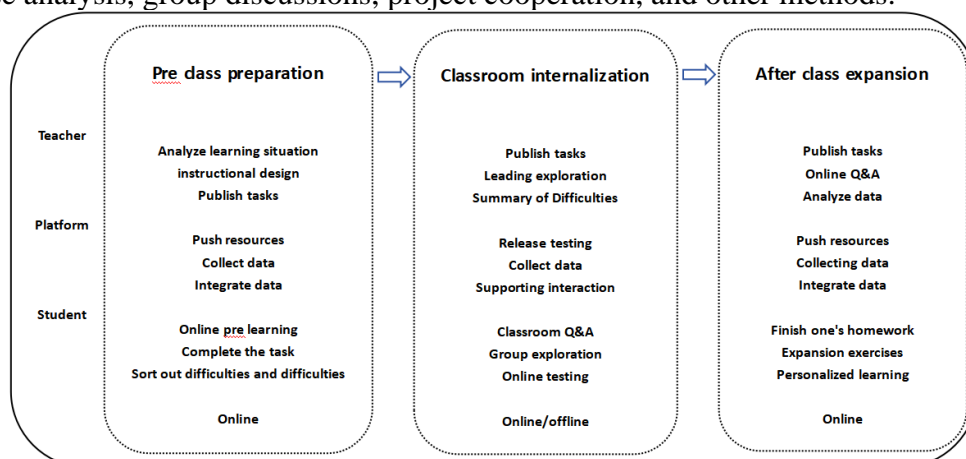


Figure 7: shows the teaching implementation process

4.1 Adopting a blended online and offline teaching approach

The course adopts a blended online and offline teaching approach, which mainly includes 6

stages: guidance from the Chaoxing platform, integration of online and offline classrooms, group discussions, flipped experiments, OP testing, and process evaluation, as shown in Figure 8. The design of the teaching process follows the principle of "student-centered", with six stages forming a closed loop. Continuously running this closed loop in the first stage of teaching implementation helps to achieve the predetermined online and offline learning outcomes for students, that is, to achieve the basic objectives of the course; In the second stage, six major ideological and political education projects and four practical innovation projects were added in the operation loop to help achieve the high-level goals of the curriculum.

Step one, select project-based teaching materials, build project cases, and push the Chaoxing platform project cases before class, so that students can scan the code to learn at any time; Step two, integrating online and offline classrooms, using the Chaoxing platform to assist classroom teaching, improving the quality of classroom teaching, and enhancing students' enthusiasm and efficiency in classroom learning; Step three, group discussion and collaboration. According to the task, students are freely grouped. Group members complete the task through discussion and collaboration, and the team leader shares the results of the task completion to cultivate students' teamwork awareness and ability; Step four, write a step-by-step practical training guide that is suitable for the learning situation of students majoring in software engineering, conduct flipped experimental teaching, and allow students to freely complete experiments. The teacher will provide feedback or answer questions; Step 5: Using the Beijing Online Programming OpenJudge platform, students can train their programming skills anytime, anywhere; Step 6: Adopting a formative assessment method based on ability training, using students, teachers, and third-party testing platforms, the learning process of students is recorded and evaluated in a process oriented manner through evaluation projects.

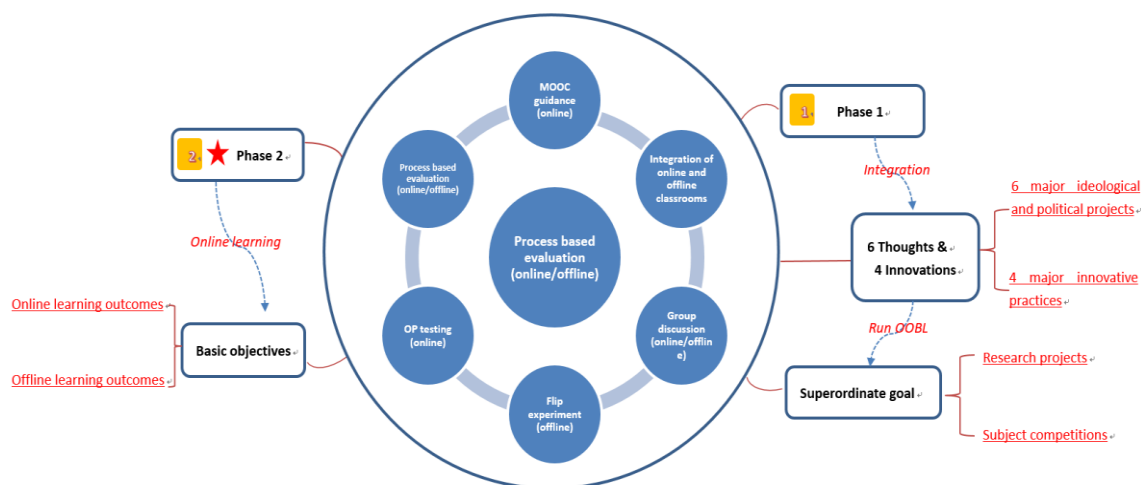


Figure 8: OOBL teaching closed-loop blended online and offline

4.2 Using enterprise cases to reconstruct teaching cases

In response to the problems in the classroom teaching process, through learning and communication, classroom reflection, and task processing, timely improvements are made to the existing problems. The improvement cases are as follows:

The lack of detailed decomposition of project content has led to students having a unclear grasp of the overall development progress of the course project, and they need to break down the course project tasks again.

The teacher reviews the completion status of students' course project tasks, provides targeted

answers to their doubts, consolidates knowledge points, organizes students to carry out work tasks, and invites enterprise teachers to provide practical training guidance.

In order to improve the learning enthusiasm and initiative of students, the previous teacher supervision has been transformed into mutual supervision and evaluation among students, and regular invitations are made to graduates of this major and classmates on campus for exchange and learning.

4.3 Integrated Course Ideological and Political Education

Science and technological progress are a double-edged sword, providing opportunities for world progress while also creating new ethical crises. Ideological and political education is a difficult issue in the construction of online open courses, which poses a challenge for many non-ideological and political education teachers. In the past, students had mastered a JavaEE framework technology and were able to apply it in terms of knowledge and skills. Nowadays, higher education has put forward higher requirements, requiring teachers to regard moral education as fundamental and to integrate ideological and political work throughout the entire process of education and teaching, because students' good comprehensive qualities and personality traits can help them clarify their life direction, establish correct values and outlook on life. Such students can not only apply JavaEE framework technology, but also shoulder the historical mission of technological confidence, technological self-improvement, and technological power, as well as the obligations and responsibilities of Chinese citizens. The JavaEE framework technology course combines student learning outcomes, ideological and political education, and practical innovation, starting from theoretical and practical teaching.

5. Conclusion

The exploration and practice of blended online and offline teaching based on the Chaoxing platform carried out by the JavaEE framework technology course group has completed the transformation from teaching oriented to learning oriented. The teaching method has also changed from full classroom teaching to active learning by students, where teachers solve problems and students learn by doing. Students' learning enthusiasm has significantly improved, and the principle of student-centered and teacher led teaching has been better implemented. At the same time, it enhances students' interest in learning, improves teacher teaching efficiency, and through diversified developmental teaching evaluations, not only improves students' professional theory and practical level, but also helps to cultivate their application innovation ability and correct core values.

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