

Original Paper

Exploration and Research on the Hybrid Model Curriculum Reform under the Collaboration of School and Enterprise

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Fund Project

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Abstract

Under the guidance of the new professional talent cultivation plan, relying on the “JSP Program Design” to construct a teaching mode, this paper has completed the exploration and research of mixed mode curriculum reform under the cooperation of school and enterprise. In the reform, various forms of interactive teaching are introduced into the classroom, fully mobilizing students’ autonomy and initiative, and reflecting the student-centered teaching spirit. At the same time, carry out activities to bring projects into the classroom, utilize open laboratory platforms, introduce industry experts, and transfer the job responsibilities of enterprises to experimental teaching, cultivating students’ abilities in four aspects: professional foundation application, thinking logic analysis, team collaboration, and innovation and entrepreneurship. The practical results indicate that the reformed curriculum model has strong applicability, significantly improving students’ learning enthusiasm, and significantly enhancing their practical application ability. The teaching reform model has the necessity of further promotion.

Keyword

mixed mode, Java, Open laboratory, College-Enterprise Cooperation

1. Introduction

JSP Programming is an important foundational course for software engineering majors, enabling students to develop and produce software through the integration of web front-end technology, data

sources, filters, and listeners, combined with MVC design patterns, and conduct in-depth research. At the same time, master the basic knowledge of JSP, such as JSP runtime environment, JSP page elements, JSP built-in objects, as well as JSP JavaBeans, Servlet technology, EL expressions, JSTL tags, etc. Deeply understand the differences between B/S and C/S applications; the meaning of each component of the URL; Configure Tomcat; Developing web dynamic engineering using Eclipse; Publish and deploy applications. Distinguish between JSP and Servlet; Declarations and program chips in JSP server scripts; JSP instruction tags, action tags, and annotations. Master the process of executing JSP applications, the relevant action instructions of JavaBean, the construction and composition of Servlet Request, the basic running process of MVC models, and the coordination working mode between various components, as well as the differences between filters and Servlets. This course belongs to the Java framework system and mainly examines students' hands-on abilities. There are many problems before and after class, such as complex knowledge points, numerous difficulties, and strong theoretical foundation, which make it difficult for students to understand; Moreover, the teaching method is single, and poor interactivity in class can easily lead to students' aversion to learning; There are too many confirmatory experiments in experimental courses, and students have to deal with them seriously. Therefore, the application of a mixed mode teaching method is the key to solving the problem.

2. Exploration of a New Mixed Teaching Model

The characteristic of mixed teaching mode is to combine face-to-face teaching with various other teaching modes in the teaching process to achieve a learning mode that promotes teaching. The implementation of mixed teaching mode requires a comprehensive examination of the teaching object, curriculum, and learning environment, followed by an overall design of the curriculum. Each chapter is divided into key and difficult points, as well as units. At the same time, the curriculum objectives, teaching resources, teaching activities, and process evaluation are analyzed and designed.

2.1 Online Teaching Mode

The important aspect of blended learning mode is the change in learning methods, which transfers a portion of learning from offline to online. Online learning has no time, location, or environmental limitations, and some leading content is placed online, allowing students to have a new learning experience and achieve autonomous learning. However, there are also some issues with online teaching. Firstly, whether the preview of courses completed online can achieve the expected results, that is, whether students can preview according to the teacher's requirements, and what are the standards for achieving this level of achievement; Furthermore, because students have already previewed relevant knowledge points, how to explain the classroom teaching process and how to grasp students' needs have become the focus of teaching design; Thirdly, preview on the front line of class is generally applicable to contemporary college students, but how to solve personal differences, that is, students are unable to effectively complete related tasks due to subjective or objective factors, and how to carry out subsequent teaching work for such students to achieve the universality of education.

2.2 PBL Teaching Method

The traditional teaching model is a process of imparting and receiving. For learners, the main way to acquire knowledge is through lectures or books. Teaching is an input method, and they only need to understand and memorize relevant knowledge. As educators, teachers view students as containers and simply fill them up. As recipients, students are in a passive position under this mode of action^[4]. PBL teaching method is a student-centered teaching method that, under the guidance of teachers, sets questions, collects data, analyzes problems, and solves problems through group discussions, thereby cultivating students' ability to independently complete work and improving innovation. The PBL teaching model emphasizes a problem oriented approach, which is the starting point of learning and the cornerstone of selecting knowledge structures. In teaching, teachers focus on cultivating practical abilities, fully leveraging students' learning initiative, advocating for students to solve problems through self-study, research, and discussion outside of class, and developing their innovative thinking to adapt to employment.

2.3 Split Classroom

Usually, the understanding of divided classrooms is that teachers and students each occupy half of the classroom time, reducing the teaching time of teachers and leaving students with a lot of discussion and thinking time. However, this understanding is not comprehensive enough. A portion of the time allocated to students should also be used as guidance time for teachers, that is, to divide the entire classroom into three parts: classroom teaching, internalization and absorption, and classroom discussion. Classroom teaching does not require teachers to cover all aspects of the teaching in separate classrooms, that is, only the framework, key points, and difficulties of the course are taught based on an understanding of basic knowledge; Internally absorb, guide students to actively learn, discover problems, ask questions about the content taught in class, and analyze and solve problems through consulting materials; Classroom discussion: Divide the class into small groups to discuss the questions raised by the teacher in class, with the teacher assisting.

2.4 School Enterprise Cooperation

School enterprise cooperation is a new talent cultivation model that is completed under the dual constraints of the school's education mechanism and enterprise management mechanism. In cooperation, the learning process of students is highly integrated with enterprise practice. In practice, enterprise management systems are used to manage students' daily lives, while learning is not separated from student attributes. It is possible to actively explore the win-win situation of school resources, enterprise resources, and social resources. At the same time, school enterprise cooperation is also an effective way for teachers to improve their professional abilities through further education. Working together between engineers and teachers can promote the improvement of teachers' skills. Teachers can also complete teaching reforms and optimize talent cultivation mechanisms under the influence of corporate management culture.

2.5 Open Laboratory

An open laboratory is a platform for resource sharing, which builds a bridge for knowledge exchange, connecting students, teachers, and professionals closely. It adheres to the principle of student-centered and teacher assisted, and has comprehensive, forward-looking, and innovative characteristics, with the ultimate goal of cultivating students' innovation and entrepreneurship abilities. Open laboratories have also abandoned the drawbacks of traditional laboratories, highlighted the cultivation of innovation and entrepreneurship capabilities, and strengthened the knowledge system structure. At the same time, different types of training are carried out for different types of students. Students can choose their interests based on the projects provided by the teacher, establish learning groups, and achieve comprehensive and collaborative development.

3. Curriculum Reform Design

3.1 Analysis of Blended Learning

In the blended teaching mode, the content ratio taught online should not be less than 30%. This mode belongs to process control, and under the supervision of teachers, it is conducive to improving students' learning initiative. In course design, it is necessary to conduct a comprehensive analysis of the course, including the current situation of the course, teaching objects, and situational design^[7]. In the overall design of the course, attention should be paid to guiding knowledge, how to divide units, and transmit relevant materials to the teaching platform. The content of each unit should be set, including chapter guidance, chapter objectives, chapter auxiliary materials, chapter activities, and evaluations.

3.2 Reconstruction of Teaching Content

Learning is a process of self-awareness, self-restraint, and self-improvement, ranging from simple comprehension to the ability to conduct analytical thinking. The ways of acquiring knowledge are diverse, and can come from books, the internet, teachers, and even classmates. However, the improvement of abilities requires learners to practice and speculate for a long time. After a detailed analysis by the teaching team, combined with the situation of the enterprise and the employment situation of students, the design and implementation of the student registration management system was selected, with a structure of B/S. The project was divided into six modules, including student management, teacher management, course management, semester management, professional management, and query statistics. To cultivate students' practical development ability and adapt to market demand, please refer to Table 1 for relevant content.

Table 1. Project Module List

Module Name	Module Content	Training Targets
System construction	Configure Java environment and preliminary system construction	Learn Java environment configuration and system construction

Student Management	Student information, student status and score management	Master the basic algorithm logic of Java
Teacher Management	Adding, deleting, modifying, and checking basic teaching information	Pre and backend operation control
Course Management	Add, delete, modify, and check basic course information	Pre and backend operation control
Semester Management	Semester setting	Mastering logical control rules
Professional Management	Professional settings	Mastering logical control rules
Query Statistics	Student information query and statistics, score management	Master the rules of statistical queries and logical operations

3.3 Online and Offline

In the integration of online teaching mode courses, firstly, it is necessary to determine the teaching objectives of the taught chapters, and the teaching objectives should be as detailed as possible to specific knowledge points, which are too general and not advisable; Furthermore, knowledge points should have coherence, continuity, and focus on the specific results achieved; Finally, the learning objectives should be quantified, and students' online behavior should be recorded and reflected through the result set, such as being able to watch videos. If students do not reach the specified duration after watching, they will not be scored. The evaluation of each chapter must be timely and accurate, with students available for reference. Teachers should establish new chapter teaching objectives while obtaining information about students' learning. After obtaining the scores, students can make learning adjustments. At the same time, this evaluation should also run through the entire course, namely before, during, and after class. For objective questions, machine evaluation is used, while for subjective questions, teacher evaluation is required. Each time, the answer results and evaluation opinions need to be provided. Offline evaluation is mainly reflected in the classroom, where teachers should always pay attention to students' learning status, including being late and leaving early, classroom performance, final assessment, etc. The relevant evaluation standards are shown in Table 2.

Table 2. Maturity Matrix

Assessment items	Score	Description
(offline)		
experiment	10	Experimental report, hands-on ability, etc
check on work attendance	10	Deduct 1 point for each delay and 3 points for absences

Class Performance	10	Q&A, interaction, discipline, etc
final-examination	50	Set questions according to the outline requirements, divided into objective and subjective questions
Assessment Items	Score	Description
(Online)		
Watching video	5	Based on the online duration (specified duration), 1 point will be deducted for any shortfall
quiz	5	Organize 2 tests with 10 objective questions each time
school assignment	10	Correct as required

3.4 Resource Sharing Platform

In comprehensive talent cultivation plans, open resource construction is particularly important, as it is not only an openness in time and space, but also an openness in learning attitude. The change in learning mode, high degree of resource sharing, and information services can significantly improve the quality of talent cultivation. On campus, fully utilize MOOC, CSDN, well-known blogs, and our school's curriculum platform to integrate shared information into students' daily learning; Off campus, sharing government, enterprise, and industry information on open experimental platforms. Students can choose to work as a teacher provided project in the laboratory, which can come from the teacher's self-research project, real enterprise projects, or shared projects on the network. During project implementation, in order to demonstrate this openness, regular collaborations with sister universities can be reached, and students can share excellent project cases in the cloud for cross school and cross professional exchanges. In order to ensure the quality of learning, the platform should be equipped with full-time teachers in relevant fields, and a mentor library should be established to invite experts from relevant fields, including talents from government, industry, and enterprises, to form a consulting group, fully leveraging the technical advantages of high-end talents. In terms of unleashing students' autonomy and initiative, regular online and offline communication activities can be held to invite graduating seniors or current students to share their thoughts and stimulate their innovative thinking.

4. Analyze the Effectiveness of Curriculum Reform

4.1 Overall Idea

(1) Overall idea

In project development, this paper actively rely on open laboratory platforms, divide development teams, and develop with entrepreneurial thinking. Under the guidance of a mentor team and full-time teachers, members of the group collaborate and progress together, breaking down the project into recognizable knowledge points, continuously optimizing and striving for excellence, reflecting the spirit of craftsmanship. Select a typical case from many case projects to analyze and design a student status management system. The system is planned to use the SSM framework, language is Java, and

database is MySQL. The system not only includes the current student status of various colleges, but also the student status over the years. It should be comprehensive, reusable, and searchable. The system functional modules include student management, teacher management, course management, semester management, professional management, and query statistics. This case is relatively close to students' daily learning and life, and project design and code implementation are relatively easy. Students can complete the preliminary design through on-site research, online reference materials, and third-party assistance.

(2) Implementation Rules

The system development of this project is divided into 6 parts, corresponding to relevant knowledge points. The detailed rules are shown in the table below:

Table 3. Allocation of Project Development Proportion

step	content	Proportion (%)
Project Background and Structure	Collect business logic related information and analyze system and data requirements	10
Environmental construction	Configuration Engineering Files	10
Module Design	Module functional structure design	40
code	Code implementation	30
Testing and Maintenance	Use testing tools or front-end development platforms to complete testing and maintain continuous monitoring of data	10

4.2 Course Evaluation

The curriculum evaluation system should revolve around two parts: objective and subjective. Objectively, it should focus on learning process evaluation and final comprehensive evaluation. The evaluation points include pre class preview, quizzes, classroom performance, experiments, assignments, and final assessments; Subjectively, the evaluation points focus on the project aspect, and the assessment is jointly completed by teachers and students. After mutual evaluation by students, the teacher conducts a comprehensive evaluation, considering evaluation points such as professional ability and collaborative ability. The evaluation criteria for the related projects of curriculum teaching method reform are shown in Table 4.

Table 4. Project Evaluation Standards

Rating level	Standard Analysis
excellent	Undertake multiple tasks, work diligently and responsibly, possess

	strong independent design ability, and strong team coordination ability; Having the ability to solve practical problems and innovative thinking; Strong ability to connect front and back platforms; Proficient in using various database objects
good	Undertake a lot of tasks, have a serious work attitude, and have a certain degree of independent design ability; Able to assist in solving practical problems and have innovative thinking; Proficient in using various database objects
medium	Undertake certain tasks and possess certain design skills; Proficient in using various database objects
pass	Undertake some tasks, have a serious work attitude, and can complete basic database object operations
fail	Not actively working and unable to complete basic database object operations

4.3 Effect Analysis

The teaching reform of this course mainly cultivates students' professional foundation application ability, thinking logic analysis ability, team collaboration ability, and innovation and entrepreneurship ability. This project was applied to the software engineering major of our college in 2021, with a total of 111 students. It was compared with students in the same major who did not undergo curriculum reform in 2020. 80 students were randomly selected from both grades, and the above four abilities were analyzed through a survey questionnaire and course assessment, as shown in Figure 1.

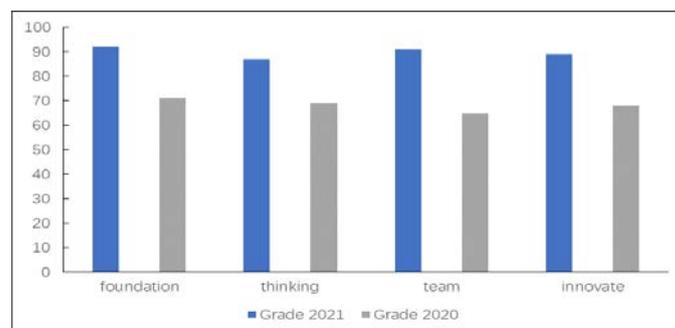


Figure 1. Comparison Chart before and after Curriculum Reform

Figure 1 shows that after the implementation of the curriculum teaching reform, the four dimensions of data for the new generation of students have significantly improved, with a 30%, 26%, 40%, and 31% respectively increase in professional application ability, logical analysis ability, team collaboration ability, and innovation and entrepreneurship ability. From the perspective of classroom performance, students have a high enthusiasm for learning and actively interact with teachers, which also indirectly

indicates that students are interested in the reform of the curriculum, learning has clear goals and directions.

5. Conclusion

The focus of this course teaching reform is the integration of multiple teaching modes. Compared with traditional teaching modes, it focuses on cultivating students' practical abilities, applying online and offline, PBL teaching, and split classroom teaching to the course. At the same time, it utilizes open laboratories to create a new teaching platform and introduces industry and enterprise experts to the platform, aiming to fully leverage students' learning initiative and move classroom teaching to experimental platforms, Subdivide the course content into project modules, aiming to cultivate students' abilities in four dimensions. Finally, establish scientific and effective evaluation standards, and the evaluation results show significant improvement in teaching quality.

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