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Exploration of the optimization of the teaching mode of JavaEE framework technology course in the integration of industry and education

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Abstract: This paper focuses on the research on "Optimization of the Teaching Mode of JavaEE Framework Technology Course in the Integration of Industry and Education", aiming to explore the improvement of the teaching quality and students' practical ability of JavaEE Framework Course through the integration of industry and education. Firstly, this paper analyzes the current teaching status of JavaEE framework courses and points out the problems of disconnection between theory and practice and insufficient practical links. Combined with the concept of integration of industry and education, the study proposes specific plans to optimize the teaching mode, including strengthening school-enterprise cooperation, introducing real projects from enterprises, constructing project-driven teaching methods, and strengthening practical teaching through the dual tutor system. Through the joint guidance of enterprise mentors and teachers in the school, students can apply JavaEE framework technology in a real-world environment and improve their technical ability and professional quality. In addition, the study also proposes an outcome-oriented teaching effect evaluation system to ensure the effectiveness and continuous improvement of teaching reform. The results show that the optimization of the teaching mode of integration of industry and education can effectively improve students' project development ability and promote their employment competitiveness.

1. Introduction

1.1 Background

With the rapid development of information technology, most of the traditional JavaEE framework technical courses are limited to theoretical teaching and experimental operation, and often cannot match the actual development needs of enterprises. As an education reform model, the integration of industry and education aims to integrate the needs of enterprises into curriculum teaching and cultivate students' practical ability through school-enterprise cooperation. In recent years, the country's emphasis on vocational education and the introduction of relevant policies on "integration of industry and education" have provided good support and guarantee for the in-depth cooperation

between schools and enterprises. In this context, the reform of JavaEE framework technology course teaching is particularly important, and how to optimize the teaching method through the integration of industry and education to improve students' practical application ability has become a key topic in teaching reform. Through the integration of industry and education, schools can provide students with more practical opportunities with the help of actual projects and development experience of enterprises, and at the same time help the school's teaching content to keep up with the forefront of technology and enhance students' employability competitiveness.[1]

1.2 Implications of the study

This study aims to solve the problem of disconnect between school teaching and the actual needs of enterprises by exploring and optimizing the teaching mode of JavaEE framework technology courses. In the traditional teaching mode, students usually have a certain theoretical knowledge and programming foundation but lack practical skills when facing enterprise projects. Through the introduction of the integration model of industry and education, the school can integrate the latest technology application scenarios and practical projects into the curriculum through cooperation with enterprises, to help students get in touch with enterprise development standards and processes and accumulate practical experience during their time at school. This not only enhances students' hands-on skills, but also develops their problem-solving skills and teamwork spirit. The teaching reform under the integration of industry and education will also help shorten the job adaptation period of graduates, enhance their employment competitiveness, and further promote the synchronous development of school education and industry needs.[2]

2. Current Status of JavaEE Framework Courses

2.1 JavaEE Framework Course Content and Structure

At present, most college and university JavaEE framework technology courses mainly focus on the introduction of basic theories and framework applications, such as popular frameworks such as Spring, Hibernate, Struts, etc. Although these courses provide students with a preliminary understanding of JavaEE infrastructure and applications, most of the course design lacks in-depth practical aspects, especially when they are out of touch with the actual application scenarios of enterprises. In enterprise project development, developers need to master not only the use of frameworks, but also the ability to deal with actual business logic, as well as experience in optimizing complex systems. However, the current curriculum system is inadequate in this regard, and students have few opportunities to be exposed to complex corporate projects, resulting in a lack of flexibility in practical applications. In addition, there is a certain lag in curriculum design, which cannot be updated in time to keep up with the latest trends in technological development, which further limits students' technical reserves.[3]

2.2 Advantages and Disadvantages of Current Teaching Model

The current JavaEE teaching mode is mainly based on the method of "theoretical lecture + experimental course", although it can help students master the basic knowledge of the framework, but its application effect in practice is not ideal. The advantage lies in the systematic nature of the theoretical curriculum, which can lay a solid foundation for students. However, the main problem with this model is that the students' practical operation is relatively limited, and most of the experimental courses are only simple framework function exercises, and lack of simulation of the real development environment of the enterprise. As a result, students often feel overwhelmed by complex

enterprise projects after graduation and find it difficult to quickly adapt to the company's development process. In addition, the teaching content is often too standardized and inflexible, and students rarely have the opportunity to choose the appropriate framework or development tool according to the needs of the project, which is not conducive to cultivating their self-directed learning and innovation ability.[4]

2.3 Status and Feedback on Student Learning Outcomes

According to the current teaching feedback, students often show a good grasp of theoretical knowledge when learning JavaEE framework technology courses, but their application ability in practical projects is obviously insufficient. On the one hand, students generally believe that the course content is relatively basic and cannot have an in-depth understanding of the actual needs of enterprise projects, especially when dealing with complex projects. On the other hand, the students' feedback on the practical part of the course showed that most of the experimental courses were mainly classroom exercises, lacking the opportunity to practice real projects, and the students' ability in teamwork and project management was relatively weak. These problems reflect that the current teaching model cannot fully stimulate students' learning initiative and innovative thinking, and there is a large gap between the curriculum and the needs of enterprises. Reforming the teaching model has become a key way to improve the learning effectiveness of students.

3. Optimizing Teaching Modes for Industry-Education Integration

3.1 Concept and Path of Industry-Education Integration

The integration of industry and education is a model of in-depth cooperation between education and industry, which aims to provide students with more practical opportunities and improve their practical ability through school-enterprise cooperation. Specific to the JavaEE framework technology course, the integration of industry and education can be achieved through cooperative education, joint research and development of teaching projects, joint training and other ways. Enterprises can participate in the design and implementation of the curriculum, provide technical support and project resources for the curriculum, and schools can provide enterprises with talents with practical skills. Through this collaboration, the curriculum can be more relevant to the needs of the company, and the teaching content can be updated to reflect the latest technological developments. At the same time, students can participate in enterprise projects during their school years, accumulate valuable practical experience, and enhance their career competitiveness. The implementation path of the integration of industry and education includes joint development projects, enterprise tutor system, school-enterprise co-construction laboratories, etc., to form a multi-level cooperation system to ensure the smooth implementation of the teaching mode reform.[5]

3.2 Optimize the design of teaching content

To meet the actual needs of enterprises, the content design of JavaEE framework technical courses needs to be optimized and adjusted accordingly. First, the teaching content should pay more attention to the coverage of practical application scenarios, and increase the teaching proportion of real project cases, so that students can better understand the application of framework technology in enterprise-level development. Secondly, the course content should be updated to cover the latest technological developments, such as microservice architecture, container technologies (such as Docker), etc., to help students keep up with technological trends. To enhance students' practical ability, the course design should also include more project training sessions, so that students can apply the framework

techniques they have learned in the project to solve practical problems. At the same time, the standards and norms in enterprise development should be integrated into the curriculum teaching, so that students can develop good coding habits and teamwork skills in the learning process and ensure that they could adapt to the needs of enterprises.

3.3 Practical Training Methods with Enterprise Projects

An important part of the integration of industry and education is to introduce enterprise projects into the course teaching, combining theoretical knowledge and practical training, so that students can apply JavaEE framework technology in the real project environment. This three-dimensional integrated teaching mode of "theory + training + project" can effectively enhance students' hands-on ability and practical experience. In this model, schools can work with enterprises to bring in real-world development projects from enterprises as part of the curriculum, and involve students in all aspects of the development of the project, from requirements analysis and design to coding implementation and test deployment. Throughout the process, corporate mentors and schoolteachers work together to guide students and help them master key technical points and problem-solving methods in project development. This not only improves students' hands-on skills, but also helps them better understand the development process and standards of enterprise projects.

3.4 Project-driven teaching and learning

The project-driven teaching model promotes self-directed learning and teamwork by engaging students in real-world projects. In this mode, the course design revolves around the actual project of the enterprise, and students not only need to master the basic knowledge of the JavaEE framework, but also need to select the appropriate framework technology and solve the practical problems in the project through the specific needs of the project. Through this project-driven approach, students gain a deeper understanding of the JavaEE framework's application scenarios, while also developing their independent thinking and problem-solving skills. During the course of the project, students are expected to work closely with team members, which helps to develop their communication skills and team spirit. In addition, the project-driven model stimulates students' interest and initiative in learning, as they can see the application of what they have learned through real projects.

4. Implementation and application of teaching reform

4.1 Practice of school-enterprise cooperation

In the teaching reform, school-enterprise cooperation is the core link in the integration of industry and education. Through in-depth cooperation with enterprises, the school can introduce more practical teaching resources and project practices to the JavaEE framework technology courses. First, the school can build a joint laboratory or development center with enterprises to provide a platform for students to get in touch with the enterprise development environment. Secondly, enterprises can participate in the design and implementation of the course and provide project cases and technical support for the course. In addition, the school can also allow students to participate in the actual development projects of enterprises during their time at the school and gain practical development experience. This kind of practice not only helps students master the practical application of JavaEE framework technology, but also helps enterprises to reach out and cultivate potential talents in advance to achieve a win-win situation.

4.2 Specific steps for the reform of the teaching model

The reform of the teaching model requires a systematic and gradual process. First, the school needs to adjust the course content and teaching objectives according to the actual needs of the enterprise to ensure that the curriculum design meets the job requirements of the enterprise. Secondly, when implementing the teaching reform, a small-scale pilot should be carried out first, and some classes or courses should be selected for the reform experiment, and the effect of the reform should be evaluated in a timely manner. Since determining that the reform effect is significant, it will be gradually extended to the whole school. At the same time, the reform of the teaching model also needs to strengthen the training of teachers and the introduction of corporate mentors. Teachers need to be up to date not only with the latest technology, but also with the ability to guide students to solve real-world project problems. Enterprise mentors can provide students with guidance on real-world projects to help them better apply JavaEE framework technologies in their projects.

4.3 Joint training model of enterprise mentors and teachers

In the mode of integration of industry and education, the joint training model of enterprise tutors and schoolteachers can effectively improve students' practical ability. The corporate tutors have rich experience in project development and industry background, and can provide students with the latest technical application scenarios and project cases, while the schoolteachers have solid theoretical knowledge and can help students better understand the basic principles and technical details of the JavaEE framework. In the joint training model, corporate tutors and teachers are involved in the design and implementation of the course to ensure that the course covers both theoretical knowledge and practical application. Corporate mentors can not only participate in the guidance of project training, but also provide students with the latest trends and development trends in the industry to help them better adapt to their future careers. This dual-tutor training model can significantly improve students' professionalism and practical ability.

5. Evaluation and optimization of the effect of teaching reform

5.1 Evaluation Indicators for Teaching Effectiveness Post-Reform

Under the integration of industry and education, the teaching reform effect of JavaEE framework technology courses can be evaluated from multiple dimensions. First, students' actual project development ability is an important evaluation criterion, and whether students can apply the knowledge they have learned in enterprise projects and effectively solve problems is the key to measure the effectiveness of teaching reform. Secondly, students' satisfaction with the course also needs to be evaluated regularly, especially in terms of the practicality of the course content, the value of project training, and the guidance effect of the instructor. In addition, it is also important for companies to evaluate students' internship performance, as they can provide feedback on students' performance and ability improvement in actual projects, to help schools adjust and optimize curriculum design. Through these evaluation indicators, schools can have a comprehensive understanding of the effectiveness of teaching reform and make timely improvements to curriculum content and teaching methods.

5.2 Continuous Improvement of Course Optimization

To ensure that the curriculum is up to date, the teaching model of the JavaEE framework technology course needs to be continuously optimized based on actual feedback and technological

developments. First and foremost, the course content should be updated regularly to ensure that the latest technology and industry needs are covered. Secondly, schools should regularly adjust the curriculum design and teaching methods based on feedback from students and enterprises, such as increasing the proportion of practical courses and introducing more project training sessions. In addition, school-enterprise cooperation should also be further deepened, the scope of cooperative enterprises should be expanded, and the types of practical training projects for students should be enriched. Through these continuous improvement measures, the curriculum can be more closely aligned with the needs of enterprises and technology trends, ensuring that students can quickly adapt to the requirements of the job after graduation.

5.3 Alignment of Student Employment with Enterprise Needs

The goal of teaching reform is to improve students' employability competitiveness, so the matching degree of students' employment performance with the needs of enterprises is an important criterion for evaluating the effectiveness of teaching reform. Through the analysis of graduate employment data, the school can understand the employment situation of students in the technical field of JavaEE framework, including employment rate, job type and salary level. At the same time, enterprise feedback is also an important reference, and the evaluation of students' work performance, technical application ability and professionalism can directly reflect the effect of teaching reform. Through these data analysis, schools can further optimize their curriculum design to ensure that they produce students who can meet the real needs of businesses and be competitive in the job market.

6. Conclusions and outlook

6.1 Summary of the study

Through the introduction of the integration of industry and education, the teaching mode of JavaEE framework technology courses has been effectively optimized. Through cooperation with enterprises, the course design is closer to practical application, and students can not only master theoretical knowledge, but also improve their practical operation ability and problem-solving ability through the practice of enterprise projects. The introduction of the dual tutor system ensures that the theoretical and practical aspects of teaching are combined, and the performance of students in the project has been significantly improved. Through the teaching reform, the employability competitiveness of students has been enhanced, and the feedback from enterprises to graduates is also more positive, which further confirms the effectiveness of the integrated teaching model of industry and education.

6.2 Future Research Directions

In future research, the application of the integration of industry and education can not only continue to be deepened in the JavaEE framework technology course, but also be extended to other technology courses. By expanding cooperation with more enterprises, the school can establish a more diversified industry-education integration model to further enhance the practicality and innovation of the curriculum. In addition, with the continuous development of information technology, schools should also keep up with the forefront of technology and update the curriculum content in a timely manner to ensure that the teaching content always meets the needs of the industry. At the same time, how to further improve the management and implementation efficiency of the dual tutor system is also an important direction for future research. Through these measures, the teaching model of the integration of industry and education can play a role in a wider range of fields and promote the reform and development of vocational education.

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References

[1] Yang Yanling, Wu Xiaojing, Jia Yuling, et al.Research on the precision education mode of integration of chemical engineering majors in higher vocational colleges under the concept of OBE[J].Chemical Design Communication, 2023, 49(11):160-162.

[2] Cao Fengping, Wang Deli, Li Chen, et al. The practice of training the concept of integration of industry and education + OBE for automotive professionals: A case study of "Automotive Electrical Equipment"[J].Internal Combustion Engine and Accessories, 2024(002):13-16.

[3] He Huiqian, Sun Wei, He Yuan, Dong Yezi. Teaching innovation design of UI design course based on OBE concept [J].University Education, 2023(9):62-65

[4] Yang Zhimei. Research on the construction and application of college English smart classroom based on OBE concept under the background of integration of industry and education[J].Journal of Jiangxi Electric Power Vocational and Technical College, 2023, 36(9):76-78

[5] Li Baoxian. Research on the teaching reform of accounting major in colleges and universities based on the integration of industry and education and the synergy of OBE concept[J].Journal of Taiyuan City Vocational and Technical College, 2024(1):105-109