Research on the Application of Code Automation Technology in the Construction of Case Library of Curriculum Group

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Abstract—**A number of related courses form a curriculum group, but the construction of curriculum group and teaching are not relevant, which affects teaching effect. By using same teaching cases, students can gradually complete the course group, deepen their understanding of the course group and improve their practical skills. This paper proposes a case library generation scheme based on code automation technology, which uses a code automation tool to complete the reconstruction of case code, and can complete the construction of a high-quality case library of course group quickly.**

Keywords—*Project-based teaching; Code automation; Case library; Course group*

I. INTRODUCTION

In a teaching system, a number of related courses form a curriculum group, and these courses have clear levels, reasonable structure, and the same curriculum training objectives. Courses in the curriculum group connect with each other to form a complete knowledge system. For example, four courses of Java Programming, HTML Web Page Making, Web Application Development Based on JSP and Java EE Enterprise Application Development can form a Java curriculum group. The knowledge points of these four courses progressively advance. The training goal of the course is to train students to master the skills of Web Page Making. Among them, Java Programming and HTML Web Page Making are the basic courses, which enable students to master the basic skills of making static web pages and Java programming; Web Application Development Based on JSP is a connecting course, which aims to use JSP to make simple and dynamic web pages on the basis of mastering the basic knowledge of Java and making static web pages. Java EE Enterprise Application Development is an advanced course, which aims to, on the basis of grasping simple dynamic web pages, learn enterprise application development, and train the ability of enterprise website development.

In the existing curriculum construction, the course in the curriculum group is generally managed by different teachers, so it is difficult to construct the course with the curriculum group idea. Due to the lack of an overall curriculum design, it lacks relevance between the courses. If students' learning ability is not particularly strong, he/she can not be thoroughly acquainted with knowledge in the process of learning. Therefore, the lack of relevance of curriculum construction, to a certain extent, affects the teaching effect.

With the development of vocational education reform, more and more attention has been paid to the practical teaching link. Now the teaching of specialized courses generally adopts the project-based teaching method. Through project cases, it combines the theoretical knowledge learned with practice, which can improve the practical ability of students [1-5]. By participating in the whole process of project development, students can cultivate practical skills and professionalism in enterprises. In the teaching process of related courses of Java curriculum group, each course has corresponding practical training activities. Through project-based training, it combines theory with practice, deepening students' understanding of the curriculum group and improving practical skills.

If similar project cases are used in the teaching of curriculum group, students can use progressive learning method in the learning process to deepen the understanding of the relationship between courses in the curriculum group. For example, when learning the HTML Web Page Making course, the static interfaces are used to complete the online e-mall interface writing. When studying the course of Web Application Development Based on JSP, we use JSP to write the interface of e-mall, and use Servlet and JDBC to develop the function. In the course of studying the course of Java EE Enterprise Application Development, the interface of e-mall is still written with JSP technology, and the business logic is realized by Spring MVC and JDBCTemplate. Through this progressive project development, students can understand the relationship between the courses. For example, JSP is about embedding dynamic scripts based on HTML, and Java EE Enterprise Application Development and JSP-based Web Application Development both design pages with JSP, and their only difference relies in the functional module code implementation method. Through the same case study, students can easily discover the links between the courses and deepen their understanding of the course.

II. CASE LIBRARY OVERALL DESIGN

The design of case library must reflect the practicality and forefront of the case, and have certain reference value and strong timeliness. A vivid case close to students' life can more mobilize students' enthusiasm for learning.

A. Case Library Design Objectives

Based on the core curriculum of software specialty, this paper constructs a case library of curriculum group, so as to build a student-centered, teacher-led practice teaching system in an all-round way through the project teaching method and case teaching method. Through case practice, students' understanding of the curriculum group is deepened and their ability to flexibly use the knowledge and practice is improved. Make students learn with more flexible learning methods, and grasp the knowledge structure more systematically.

B. Design Principles of Case Library

The basic principles for the design of the case library are as follows:

1) Case normalization

The case should have a detailed specification of the requirements, describing each function in detail. Requirements specification provides a simple effect interface for each function, and describes the restriction conditions of each field on the interface, such as the length of the input content in the field, the format of the field, and so on.

2) Content relevance

Case content must be closely combined with the task of the enterprise, and be written around the task. A typical program development task generally includes the design and writing of the interface, database access and process control. So in the design of the case, it is necessary to include as many typical tasks as possible, and make students practice as many typical tasks as possible through the implementation of the case, in order to make students master the skills to meet the actual needs of enterprises.

3) Practical usefulness

Case materials must come from the actual development projects of the enterprise. Students' participation in case development can effectively improve their ability to analyze and solve problems. They can really apply the theoretical knowledge learned in ordinary times to the enterprise project development, and achieve the purpose of combining theoretical learning with practical application.

III. CASE LIBRARY CONSTRUCTION

The Java Web application development direction of software specialty is mainly oriented to the first-line posts in the outsourcing industry and related fields of social informatization, for the purpose of training skilled talents who are familiar with the Eclipse development platform, familiar with software development process, and able to engage in Java Web program development, testing and other work in the production line. Through enterprise survey, we found that Java Web applications developed by enterprises are generally management information systems involving database

operations. According to statistics, there are a lot of program codes related to the operation of the relational database in management information system. About 70% of them are related to the operation of relational database. Database operation code is mainly to save the data in the database, and then query, modify and delete the data, so that the management information system code has a high similarity. Code automation technology can be used to generate case code.

The case library serves for teaching and is used to support the cultivation of students majoring in software. Therefore, the construction of case library must be centered on the typical tasks of the enterprise. We adopt the idea of "operating post-typical work task-teaching case" to develop the teaching case library of Java curriculum group. Through enterprise survey, graduate survey and recruitment website survey, etc., we determine that the students of software technology major in higher vocational education are mainly aimed at the position of Web site development engineer; Then through the in-depth survey of the enterprise, especially the interview with the enterprise engineers, the typical work tasks of the Web development engineers are determined. Through the analysis of typical work tasks, the knowledge and skill points needed to complete these tasks are determined. Finally, it shall select and generate the case library according to the knowledge and skills. The project case is used for the purpose of teaching service. So the case should contain as many knowledge points as possible.

In the process of case construction, we decompose the typical project production process, determine the task, and reconstruct and integrate the teaching module with the task as the center. Typical work tasks for a Web development engineer include: Foreground graphical interface design, foreground data verification, dynamic web design, business logic processing, request flow processing, etc. Cases in the case library will be required to focus on Web application development tasks. According to the characteristics of the course, cases will be required to cover whole or part of the Web application development tasks. For example, HTML Web Page Making does not include the processing of dynamic business logic, while the case only contains two typical work tasks: "Graphical Interface Design" and "Data Format Verification", and JSP-based Web Application Development and Java EE Enterprise Application Development include all work tasks. In the selection of cases, we take real projects or training projects actually developed by enterprise as the basis, and through the analysis of these projects, selection, cutting and editing, we will further collate the project. At the same time, according to the students' existing knowledge structure, the enterprise project functions are re-filtered, and the functions that are too complex are cut down. Then it is required to establish the corresponding database of the project, use code automation tools to generate project code, collate the project's requirements design documents, complete the construction of the case.

IV. CODE AUTOMATION TOOLS

Code automation technology is the technology that generates application code through computer programs. Code automation can reduce the workload of developers, reduce the error rate of programs, and improve development efficiency [6-13]. A code automation tool typically contains metadata, code templates, and business rules.

(1)Metadata: Metadata is mainly a description of data resources, such as data tables involved in business logic code, field information contained in each data table, and so on.

(2)Code template: The code template is the basic format used to assemble the code. Java EE Applications generally use MVC design patterns, and each layer of code implements similar functions. The same part of each layer of code can be extracted as a code template for that layer of code.

(3)Business rules: Business rules contain basic business logic definitions, such as query criteria, fields adding / modification, and so on.

The code automation tool will read the metadata file and the business rule file, obtain the data table structure according to the metadata, and generate the corresponding entity class; the business logic generation controller, service layer, database access layer and view interface code are determined based on the business rule file. The code generation adopts the method of replacing the content of template file, such as generating an adding function page, generating a field list of the adding page according to the business rule file, then reading the template file, replacing the dynamic part with the field list, and generating an adding function page.

V. CONCLUSION

In a teaching system, a number of related courses form a curriculum group, and these courses have clear levels, reasonable structure, and the same curriculum training objectives. Courses in the curriculum group connect with each other to form a complete knowledge system. But the construction of curriculum group and teaching are not relevant, affecting the teaching effect. By using the same teaching cases, students can complete the course group progressively, deepen their understanding of the course group and improve their practical skills.

In the process of constructing case library, we decompose the typical project production process, determine the task, and reconstruct and integrate the teaching module with the task as the center. This paper designs and implements a code automation tool, which is used to assist the construction of case library of curriculum group, and speeds up the construction of case library of curriculum group.

REFERENCES

[1] A. Noriega, J.M. Sierra, J.L. M.J. Cortizo, Prieto, F.F. Linera and J.A. Martín. Project-Based Learning Applied to Mechatronics Teaching, New Trends in Educational Activity in the Field of Mechanism and Machine Theory, 2019. pp 49-56.

[2] C. Zhang, X. Zhang. Research and Practice of Project Teaching Method in CAD/CAM Course Teaching. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, 2018, pp 144-152.

[3] L. Zhang. The exploration and practice of project teaching method in web design and production. Comput. Knowl. Technol, 2015, pp 179–180.

[4] H. Zhou, Y. Luo, Y. Luo. The application and research of project teaching in the practical course of University's NC Professional. Technol. Innov, 2014, pp 95–96.

[5] Y. A. Mehta. A project-based learning method to teach concepts of viscoelasticity and its applications to seniors and graduate students in biomedical, civil, chemical, and mechanical engineering. ASEE Annual Conference and Exposition, Conference Proceedings, Salt Lake City, 2018.

[6] M. Yang, J. Shi and M. Li, Design and Implementation of code generator based on MDA, Computer Engineering, vol. 35, 2009, pp. 47-9, 53.

[7] N. Hafidhoh, I. Liem, and F.N. Azizah, Source code generator for automating business rule implementation, 2015 International Conference on Data and Software Engineering (ICoDSE), Piscataway, 2015, pp. 219-224.

[8] S. Nadir, and D. Streitferdt, Software code generator in automotive field, 2015 International Conference on Computational Science and Computational Intelligence (CSCI), Los Alamitos, 2015, pp. 13-17.

[9] M. K. Shiferaw and A. K. Jena, Code Generator for Model- Driven Software Development Using UML Models, 2018 Second International Conference on Electronics, Communication and Aerospace Technology (ICECA), Coimbatore, 2018, pp. 1671-1678.

[10] D. H. Park and S. D. Kim, XML rule based source code generator for UML CASE tool, Proceedings Eighth Asia-Pacific Software Engineering Conference, Los Alamitos, 2001, pp. 53-60.

[11] C. Supaartagorn, Web application for automatic code generator using a structured flowchart, 2017 8th IEEE International Conference on Software Engineering and Service Science (ICSESS), Beijing, 2017, pp. 114-117.

[12] M. A. S. Talab and D. N. A. Jawawi, A code generator for Component Oriented Programming framework, 2011 IEEE Conference on Open Systems, Langkawi, 2011, pp. 225-230.

[13] J. Shan, D. Ma, B. Zhang and W. Luo, Research and Implementation of Code Generator for Information System Based on SOA, 2009 International Conference on Scalable Computing and Communications; Eighth International Conference on Embedded Computing, Dalian, 2009, pp. 143-147.