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Research on the New Teaching Model of "Using Evidence to Promote Teaching, Integrating Curriculum and Evidence"—Taking the Course "Software Process and Management" as an Example

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Abstract: Based on the requirements of talent training of Guangdong University of Science and Technology, the teaching reform of Software engineering compulsory course Software Curriculum and Management is carried out. Based on students' basic learning conditions, this paper reconstructs the teaching content, integrates the high-level test points of the soft test into the course teaching, introduces the soft test case learning to enrich the online teaching resources of this course, runs through the course teaching with real project practice, and adopts the BOPPPS teaching mode and combines teaching evaluation reform and other aspects to practice the new teaching mode. In order to achieve the purpose of personnel training.

1. Introduction

1.1. Research background

The Implementation Plan for National Vocational Education Reform clearly proposes to deepen the reform of the training mode for composite technical and skilled talents, draw on the common practices of international vocational education and training, formulate work plans and specific management measures, and launch the pilot work of the 1+X certificate system. The pilot work should further leverage the role of academic certificates, consolidate the foundation of students' sustainable development, encourage vocational college students to actively obtain multiple types of vocational skill level certificates while obtaining academic certificates, expand their employment and entrepreneurship skills, and alleviate structural employment contradictions[1].The administrative department of human resources and social security under the State Council organizes the formulation of occupational standards, while the administrative department of education under the State Council takes the lead in organizing the development of teaching and other related standards in accordance with occupational standards. All types of vocational skill level certificates have equal validity, and holders of certificates enjoy equal treatment. The document clearly emphasizes the

importance of students obtaining vocational skills certificates and improving their competitiveness in the job market[2].

1.2. The development of Guangdong University of Science and Technology requires enhancing students' employment competitiveness

Guangdong University of Science and Technology (GUST) is an applied and innovative undergraduate university. With the vision of "creating a century-old university and educating industrial elites", GUST will build itself into a first-class and nationally renowned high-level applied and innovative university in Guangdong. Guangdong University of Science and Technology points out in the "14th Five-Year Development Plan" that by 2025, the comprehensive strength of the school will enter the forefront of application-oriented private undergraduate universities in Guangdong Province and the first front line of application-oriented private undergraduate universities in China. The school insists on the fundamental task of promoting morality and educating people, carries forward the school motto of "advocating morality, learning, fine arts, and practicing", pays attention to the comprehensive development of morality, intelligence, physical beauty and labor, and cultivates key abilities such as good learning ability, thinking ability, expression ability, action ability and willpower, and has a strong sense of social responsibility, solid professional ability, and strong practical application ability. High-quality application and innovation talents with certain application and innovation ability and cross-cultural communication ability. Promoting learning by certificate and promoting teaching by certificate can further improve the professional basic ability of students in our school. The course of Software Process and Management mainly introduces how to apply modern project management ideas and methods to the implementation of software projects. "Software Process and Management" is a required course in the first semester of the senior year of software engineering major. The course requires students to further understand the implementation process and technical characteristics of software engineering projects, and master the knowledge and means of project management on the basis of understanding the basic idea and methodology of software engineering. So as to obtain the necessary professional ability reserve before entering the industry and starting career work.

1.3. The employment pressure is increasing year by year, and the teaching mode needs to be reformed and innovated

The learning content of "Software Process and Management" is mostly the same as that of the information system project management division. The information system project management division is a soft examination advanced qualification examination, and the certificate can evaluate the senior professional title, but also have the level and ability to engage in related professional positions. The certificate of Information System Project Manager can help individuals improve their employment competitiveness. In the job market, applicants with this certificate are often more favored by employers, because the certificate represents that the candidate has a certain level of professional knowledge and skills, and is competent for project management related work. The certificate of information system Project Manager can help candidates get promoted and raise their salary. Within the enterprise, employees with this certificate are often regarded as having higher ability and quality, so they are more likely to be valued by leaders and get corresponding promotion and salary increase opportunities. "Software process and Management" is a theoretical subject, different from other courses that focus on program coding, it emphasizes students from the perspective of project managers, on the basis of familiarity with software development, combined with the knowledge of management economics to effectively control the software development process, in order to achieve the purpose of project success expectations. Students lack project

management experience, if only according to the requirements of the course teaching objectives, they lack the ability to apply theory. The case analysis of information system management division in the course can make students have a deeper understanding of the knowledge of the textbooks, and it also makes the course content updated in time to achieve the effect of keeping pace with The Times, and the depth and width of the course are also effectively expanded.

2. Current situation analysis

2.1. The current teaching mode of Software Process and Management does not meet the requirements of talent cultivation

At present, the course Software Process and Management adopts Software Project Management, written by Li Bing et al. The main content of this textbook is the knowledge of ten fields and five process groups of project management, among which scope management, cost management, schedule management, quality management and risk management are more important contents. This course is set up for senior software engineering students, arranged in the first semester of the senior year, students have little interest in this kind of theoretical courses, and lack of project development experience, and senior students have begun to prepare their graduation thesis and enterprise internship, relatively busy, more perfunctory to this kind of theoretical courses[3].

Software Process and Management is a compulsory course in the major, with a closed book exam as the assessment method. The regular score accounts for 40%, and the final exam score accounts for 60%. Some students are not diligent in class and work overtime to review at the end of the semester, resulting in poor overall performance, rapid knowledge forgetting, and failure to apply what they have learned to actual project development. Students lack awareness of application and have low learning enthusiasm.

2.2. The rapid development of schools urgently requires innovative curriculum reform

At present, the knowledge points of "Software Process and Management" are too scattered, and the knowledge points are too abstract, which is not closely related to students' practical life. Students have difficulties in understanding and mastering the knowledge. On the other hand, the knowledge points of "Software Process and Management" are mostly the same as those of the information system project management exam, except that the learning content of information system project analysis is broader and more difficult. This teaching reform is based on the course of "Software Process and Management", combined with the examination content of information system project management teacher, to sort out the knowledge points of this course. Based on the graduation requirements of the Software Process and Management course in the Software Engineering Talent Training Program, and referring to the knowledge points of the software exam, the course objectives of this course have been redefined. Based on the textbook and students' learning foundation, develop the teaching schedule and teaching plan for this course, as well as determine the key and difficult points of each chapter and teaching design[4].

2.2.1. Determination of course objectives and analysis of achievement paths

According to the talent cultivation plan of software engineering education and the requirements of information system project managers for candidates, the teacher team of this course has reorganized the knowledge content of "Software Process and Management", and determined the course objectives based on the content of each chapter and its supporting relationship with the course objectives. The specific objectives of the course "Software Process and Management" are as

follows.

Course objective 1: Students will be able to understand and master the basic concepts of project management through the study of software project management fundamentals, understand and master the knowledge system structure of project management, and accurately distinguish the input, tools, and technologies of the ten major fields of project management, as well as the main content of the output. The ways to achieve the course objectives are theoretical explanation, practice, and case analysis.

Course objective 2: Through the study of scope management, schedule management, and cost management in software project management, students will be able to independently complete project cases for comprehensive analysis, independently depict project schedule control diagrams, accurately calculate project cost control situations, and master the basic methods of project cost schedule control. The ways to achieve the course objectives are theoretical explanation, practice, and case analysis.

Course objective 3: Through knowledge of software project scope management, procurement management, and configuration management, students are able to comprehensively analyze common scope, configuration, and human resource management issues in projects and propose effective management methods. The ways to achieve the course objectives are theoretical explanation, practice, and case analysis.

Course objective 4: Through the knowledge of human resource communication management, risk management, and quality management in software project management, students can master the communication management of project teams, effectively manage and control projects, and organize and coordinate the completion of projects. The ways to achieve the course objectives are theoretical explanation, practice, and case analysis.

2.2.2. The support of course objectives for graduation requirements

Course objective 1: Support graduation requirements 3-4: Ability to comprehensively consider safety, health, law, intellectual property, culture, and environmental constraints throughout the software system lifecycle and optimize the system. The contribution degree is 0.25.

Course objective 2 supports graduation requirements 4-4: to be able to correctly collect and organize experimental data, analyze and interpret experimental results, and obtain reasonable and effective conclusions. The contribution degree is 0.25.

Course objective 3 supports graduation requirement 9-1: Understand the positioning and responsibilities of the team and its members, be capable of fulfilling individual roles in the team, and conscientiously fulfill them. The contribution degree is 0.25.

Course objective 4 supports graduation requirement 11-1: Understand the cost composition in the project development process of software engineering, master the principles of engineering management and economic decision-making methods related to team organization, schedule control, risk control, etc. The contribution degree is 0.25.

By analyzing the requirements of the graduating class of this course in the talent training program, the teacher team of Cheng set the corresponding course objectives and the ways to achieve the course objectives, and then carried out the teaching design of the course.

3. Content of teaching reform

3.1. Enrich the learning resources of network teaching platform

3.1.1. Enrich the learning resources of network teaching platform

The teaching team has imported nearly three years of information system project manager's real questions over the years into the Super Star platform, including comprehensive knowledge, case analysis and thesis topics, and classified according to the knowledge points of each chapter to form a perfect course resource library. In addition, teachers record teaching video resources according to various important and difficult points, guide students to complete the preview and review before and after class, establish a good online learning communication environment, and provide a favorable platform for students' independent learning.

3.1.2. Implement blended online and offline teaching

The course Software Process and Management has a lot of knowledge points. The teacher adopts appropriate teaching mode according to the actual situation of students, encourages students to preview before class, learn independently, and master the learning situation of students through the teaching AIDS provided by Superstar and other learning platforms. For example, the learning progress of video resources and question bank resources, the number of visits of students, the completion effect of classroom exercises and homework are assisted in teaching.

3.1.3. Develop case teaching and project teaching methods

This course takes case teaching and project teaching as the teaching baseline, and takes "actual cases as the main line, teachers as the guidance, and students as the main body" to complete.

Case teaching: In the expansion of classroom teaching, teachers introduce comprehensive cases of soft test according to the knowledge points of this chapter, guide students to make comprehensive analysis of cases based on the various contents of the ten project management, and improve the application ability of students' theoretical knowledge. For example, in the fourth chapter of the teaching of project progress management, the problem solving about progress in the implementation process of the software project with the subject of the soft test is introduced to deepen students' knowledge, expand students' scope of knowledge, and improve students' understanding and analytical ability of knowledge.

Project teaching: At the beginning of this course, the teacher introduced the real project "Huizhou Dog Management System" in August 2024 of Guangdong Tendering Website. With this project as the background, the students focused on the ten knowledge areas of project management. After the knowledge points of each chapter, the students worked as a group to complete the preparation of the project management plan and project documents, including the twelve sub-plans of project management. Students work in groups with clear division of labor. Through practical case analysis, students can deepen their understanding of the various processes of project management and improve their hands-on ability.

3.1.4. BOPPPS teaching model is adopted

This course adopts the teaching mode of BOPPPS and is divided into introduction Bridge-in, which introduces the content of the current course, determines Learning Objectives, Pre-assessment, Participatory Learning, participatory learning. Post-assessment and summary are carried out in six stages. Based on the students' foundation as the starting point, the teaching design is re-designed

according to the teaching mode of BOPPPS.

3.1.5. The curriculum incorporates ideological and political elements

In the teaching process, the current affairs and politics are combined, the ideological and political elements are effectively integrated, and the craftsman spirit of a great country is integrated into specific project cases, so as to make students learn project management knowledge, shape a correct outlook on life and career, and cultivate patriotic sentiment.

3.2. Curriculum teaching evaluation method reform

This course takes "learning as the center, teaching as the leading" as the starting point, combined with the teaching process evaluation and final evaluation, to form the learning evaluation of this course. The total score of this course = 5% of attendance score + 5% of class performance + 10% of online learning + 10% of homework + 20% of periodic exercises + 20% of project acceptance + 30% of final exam. The assessment rules are mainly as follows.

Class attendance: The attendance of each class.

Classroom performance: The teacher's record of the student's class performance.

Online learning: Super Star learning Pass learning record.

Homework: Completion of unit test questions and assigned work.

Stage exercise: the completion of the super star question bank.

Project acceptance: Students are required to complete the project management plan of the project with the theme of "Dog Management System of Huizhou City" as a team, including the sub-plans of project scope management, cost management, progress management, quality management and configuration management, as well as four benchmarks and one development plan, and correctly write the input, technology, tools and output of the main activities of each sub-plan. The project should be reported before the end of the course, and the teacher will comprehensively assess the practical ability of the students through the acceptance and reporting of the project plan.

Final examination: offline centralized examination, through the final examination to evaluate the theoretical learning of students. Among them, 50% are subjective questions, which aim to comprehensively examine students' mastery of project management knowledge. 50% are subjective questions, which mainly assess students' ability to comprehensively analyze and apply knowledge.

4. Effect of teaching mode reform

4.1. Reconstruct teaching content and enrich online teaching resources

The teaching team has nearly three years of information system project manager's real questions over the years, including comprehensive knowledge, case analysis and thesis titles, are imported into the Super Star learning platform, and are classified according to the knowledge points of each chapter to form a perfect course resource library. In addition, according to the various important and difficult points, the teaching video resources are recorded to guide students to complete the preview and review before and after class, establish a good online learning communication environment, and provide a favorable platform for students' independent learning.

4.2. Teaching model innovation

Through this teaching reform, the knowledge of the test points of information system management analysts is effectively integrated into the course teaching. Based on the teaching materials and relying on the soft test, the complete teaching design of this course is developed by

fully integrating the characteristics of the two. The teaching mode of BOPPPS is adopted to effectively improve the teaching efficiency of this course.

4.3. Improve students' interest in learning

Through this teaching reform, students' understanding of software project management knowledge is deepened, students' learning interest is improved, and students' visits to super star courses, video viewing and topic exercises are significantly higher than those of previous students. Through real project practice, students' comprehensive application ability of project management is improved.

4.4. Enhance students' professional skills

Through a semester of study, the number of students registering for the soft test has increased, and the number of students passing the soft test has also increased, improving the competitiveness of students' employment.

5. Conclusions

"Software Process and Management" is a comprehensive course combining software development and project management, involving a wide range of knowledge. Based on the country's requirements for the training of applied talents, the need to improve students' employment competitiveness, and the graduation requirements of the talent training program, this paper sets the course objectives of this course. Through the reconstruction of the course knowledge system, the online teaching resources are enriched, the BOPPPS teaching mode is adopted, and the curriculum reform is carried out in many aspects, such as project teaching and reform teaching evaluation. To achieve the purpose of mobilizing students' learning enthusiasm, improving students' application ability of comprehensive knowledge, enhancing students' employment competitiveness, and achieving talent training.

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