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Construction and Application of "Project-oriented and Hybrid" Online Quality Courses in Higher Vocational Colleges under the Digital Background - Taking "Software Testing" as an Example

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Abstract: Online excellent course refers to an online demonstration course with high course quality, wide sharing range, good application effect and strong demonstration effect. It is the carrier of high-quality education resources, and also an important content in the teaching quality and teaching reform project of colleges and universities. This paper takes the "Software Testing" course in higher vocational colleges as an example, aims to build a "project-oriented and hybrid" online high-quality course construction and application paradigm, and researches on "project-oriented" course system, digital high-quality resources, structured course team, mixed teaching mode, multiple assessment and evaluation system, etc., to provide certain references for improving the quality of online open course construction. So as to promote the reform of education information.

Keywords: Digitization; Project; Hybrid; Online boutique courses

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1. Introduction

In September 2020, the Action Plan for Improving the Quality of Vocational Education (2020–2023) pointed out that "vigorously promote the new form of Internet + and intelligent + education," promote the reform and innovation of education and teaching and select about 5,000 online high-quality vocational education courses at different levels. High-quality online open courses are the product of the deep integration of modern information technology and education and teaching. It breaks through the limitations of time and space and realizes the sharing of high-quality resources. Therefore, the construction of high-quality online open courses is very meaningful.

2. Course design

2.1. Course positioning and objectives

"Software Testing" is a core compulsory course for software technology majors. It is offered in the third semester. It is a course with wide coverage and strong practicality, practicality and professionalism. The course aims to cultivate the knowledge of explaining and summarizing test methods, standardizing test case design, flexibly operating test tools, identifying and finding software defects, etc. Be able to analyze, design, plan and review software defects flexibly and scientifically. To practice the core values of socialism, and enhance ideals and beliefs, craftsman spirit, responsibility, labor spirit, professional ethics, and innovation consciousness.

2.2. Curriculum structure and content

The curriculum is based on national teaching standards for software technology majors, talent training programs, national computer rank examination software testing standards, and national vocational education planning textbooks for software testing. Professional teachers and enterprise engineers select typical tasks for software testing posts, taking vocational post ability as the standard. Taking Inspur Group and other enterprises' real software testing work projects as the carrier to design the teaching content, guided by the cutting-edge technology of ISTQB international software testing and certification system, the new technology and new standards of automated testing tools are integrated into the teaching content [1]. The National Vocational College Skills Competition software test items competition tasks and "1+X" web application software test (intermediate) certificate into the course content, as a supplement, strengthen and expand. Based on the systematic design idea of the work process, a series of typical work tasks are selected, and 6 software test ladder items and 16 tasks are sequentially reorganized and designed according to the principle of knowledge continuity from simple to complex [2]. Under the guidance of teachers and group cooperation, "project progressive" teaching from shallow to deep is implemented [3].

The 6 projects are: "Writing and designing test cases and documents," "Testing software function," "Testing software structure," "Testing software unit," "Automated testing software," and "Testing software performance." Combined with the characteristics of course engineering practice, taking Chinese software application development to Chinese software independent creation as the main line, six ideological and political modules including "ideal and belief, craftsman spirit, responsibility, labor spirit, professional ethics and innovation consciousness" were designed according to the different teaching contents of 6 projects and 16 tasks, and 16 ideological and political elements were mined [4].

3. Curriculum construction

3.1. Curriculum resource construction

The course takes the work project as the carrier, the skill project training as the main line, and the completion of the project task as the teaching goal. It organizes the "project - task - knowledge/skill" and "three-level" resource system based on the work project and takes detailed knowledge points/skill points as the basic unit. According to the learning needs of learners at different levels such as middle and higher vocational colleges, higher vocational enrollment expansion of millions, "1+X" certificate training, and enterprise technical personnel [5], teachers reorganize and reference the needs of course resources, according to the functional positioning of learning and teaching assistance, and based on the concept of integration of production and education, school-enterprise cooperation develops video, PPT, unit tests and other types of resources. The

project covers all knowledge points of the course, the resources present various methods and tools of software testing and comprehensively cover the skill points of software testing work. The course learning process is the process of project completion, and the knowledge points/skill points resources of the course are released through the implementation of the project. The course keeps up with the development of the industry, adds new technology and new standard content in time, updates knowledge points/skill points resources based on industry technology in time, increases discussion topics based on ideological and political dynamics, and regularly updates tests and examination questions to meet the needs of project-based teaching for integrated teaching and personalized reorganization of resources inside and outside the school [6].

3.2. Curriculum team building

Taking the project as the carrier, centering on the five aspects of "project-oriented" course design, "three-level and multi-category" resource construction, "online and offline hybrid" teaching implementation, dual-line cooperation in teaching practice skills improvement, and "four-dimensional integration and diversification" assessment and evaluation, the school has built a "course dual-person system" for teachers and enterprise engineers and implemented "team cooperation to promote common improvement" [7]. Establish a complete school-enterprise teacher coordination mechanism (**Figure 1**). The structured teacher team of the school-enterprise division of labor cooperation will assume the responsibilities of teaching and project management according to the content and difficulty of the course project. The teachers in the school are good at designing lectures, and undertaking the tasks of course teaching and resource construction, while the teachers in the enterprise have rich practical experience, undertaking the tasks of project introduction and practical teaching, and strive to focus on one project module for each teacher to build "specialized, refined and deep" coach teachers. In the teaching guidance, division of labor, cooperation, communication and sharing, each other empowers and promote each other, promote the improvement of teachers' skills, and engineers' teaching level, and build a double professional, structured and innovative curriculum team with "noble ethics, high science and practice, and collaborative progress."

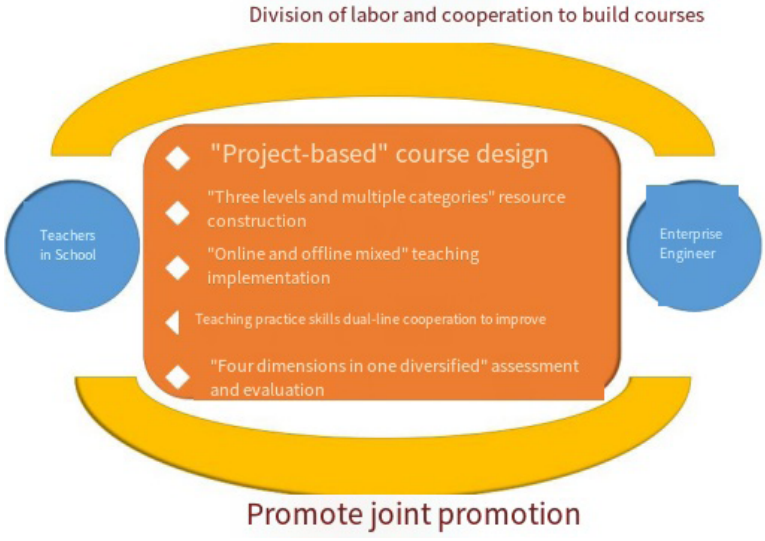

Figure 1. School-enterprise division of labor cooperation structured teaching innovation course team.

4. Curriculum implementation

4.1. Teaching implementation strategies

Based on the complexity of the project, the progressive project will be arranged in different class hours [8]. For students on campus, each project is organized in two stages: "Analysis of key and difficult points of project knowledge" and "Implementation guidance of project tasks." The project is implemented in three stages: self-study before class, guidance during class and development after class. With students as the center, the digital resources of "three-level and multi-category" courses are rationally arranged and released, and teaching methods such as online Q&A and discussion, case teaching and flipped classrooms are adopted to design and optimize teaching activities that connect online and offline to guide students' learning through projects and stimulate students' enthusiasm for learning [9].

For off-campus learners, through the online platform, the implementation of "self-study test, topic discussion, online guidance, and offline project practice" constitutes the "MOOC learning trilogy." Relying on the comprehensive ideological and political resources of the course, through the whole process of "pre-class situation and policy guidance, hot case interaction during class, and industry project practice after class," the MOOC combines static and dynamic learning to improve the ideological morality and professional quality of learners from six aspects: ideal and belief, responsibility, labor spirit, craftsman spirit, professional ethics, and innovation consciousness [10].

4.2. Curriculum assessment and evaluation

With learners as the center, the evaluation and evaluation system of "four-dimensional integrated diversification" online high-quality courses should be constructed, and the practice research of diversified evaluation and evaluation should be carried out, as shown in **Figure 2** [11].

Figure 2. "Four-dimensional integrated diversification" evaluation system.

(1) Diversification of evaluation methods [12]

For on-campus students, online process + result evaluation, offline process evaluation, comprehensive evaluation, value-added evaluation and other assessment and evaluation methods are adopted [13]. Online process + outcome evaluation: Unit test + discussion + online examination; Offline process evaluation: Class performance + thematic assignment + project task; Comprehensive evaluation: Write test plan + write test summary (2 required), test function + test code + test unit + test performance + automated test (2 out of 5); Value-added evaluation: Every 20 project units, based on students' self-study test before class, mutual evaluation of project groups in class, and after-school expansion project three stages of performance growth rate value-added scoring. For off-campus learners, online process + outcome evaluation is adopted.

(2) The evaluation content is diversified

Through the analysis of activity performance and platform data, the project evaluates learners' various abilities to form a diversified evaluation content, including not only the vocational skills evaluation of learners' mastery of basic knowledge and skills but also the professional quality evaluation of learners' independent learning ability, cooperation ability, emotional attitude and so on.

(3) The evaluation subject is diversified [14]

The project carries out research on the subject of teaching evaluation for learners, partners and teachers. Through the multi-subject evaluation of "teacher evaluation, inter-group mutual evaluation, intra-group self-evaluation and individual total price" in teaching activities, learners can fully understand and develop themselves from multiple perspectives.

(4) Diversification of evaluation methods

The project carried out the research of evaluation methods through formative evaluation and summative evaluation. The formative evaluation mainly evaluates learners' online learning and activities objectively by setting reasonable weights of teaching activities in the platform. The summative evaluation is mainly through the evaluation of the learning works submitted by learners [15].

5. Effect of curriculum implementation

5.1. Students" participation and enthusiasm in learning have increased, and the degree of achievement of curriculum objectives and the quality of talent training has been greatly improved

Online, students' online self-study and discussion are carried out alternately, online learning is highly responsive, and teacher-student interaction is full, which promotes students' independent and collaborative learning and improves the teaching effect. Offline, the students took the initiative to complete the project, the project standard rate reached 85.32%, and the excellent rate reached 73.8%.

5.2. The team innovatively implemented blended teaching, and realized leapfrog development of information-based teaching ability and teaching reform

In view of the characteristics of multiple learning objects, the team continues to optimize digital resources, the division of labor between online and offline of the school-enterprise team is clear, and the intelligent data analysis of the platform is fully utilized to provide personalized services for students. Unit tests and exams are scored by the platform independently, and the platform empowers teachers to reduce their burden and focuses

on explaining important and difficult points and project tasks in class, which improves class efficiency.

5.3. The completion rate of course video and other resources reached 78.37%, and all resources were equal to the application

33 colleges and universities use this course as teaching resources to carry out blended teaching on campus, and the satisfaction rate of course resources survey reaches 92.9%. The students are highly responsive to learning, and the teacher-student interaction is active. 469 students have passed the 3-phase examination, 507 have posted, and 732 have interacted with the course. The course score is 5.0 (full score 5.0). Through the platform setting flexible test composition and blocking switching procedures, course video questions, etc., effectively prevent exam questions brushing, cheating, brushing lessons and other problems. The course signed an agreement with the love course network, the platform guarantees information security, meets the requirements of data supervision, and carries out strict review and confirmation of course information, course resources and student scores before and after the beginning of the course.

6. Conclusion

Through the construction and application of "project-based and hybrid" online high-quality courses in vocational colleges, promote the construction of online high-quality resources with vocational education characteristics, improve the supply of digital resources and services, standardize the path of online teaching activities, deepen the application of network platforms, deepen the integration of information technology and education and teaching, improve the enthusiasm of learners, improve the teaching effect and talent training quality. To provide cases and materials for exploring, constructing and improving the construction and application of online high-quality courses in vocational colleges. At present, although certain results have been achieved, the course structure, course resources, course evaluation and so on can continue to optimize and improve, so as to further improve the quality of online courses.

Disclosure statement

The authors declare no conflict of interest.

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