

Research on Skills Competition Empowering Teaching Reform of Computer-Related Majors in Higher Vocational Colleges

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Abstract: At present, with the rapid development of the digital economy, computer-related majors in higher vocational colleges assume the key responsibility of cultivating high-quality digital talents. As an important carrier for testing and improving the quality of talent training, skills competitions have now become a key driving force for promoting the reform and development of education and teaching in higher vocational colleges. This paper carefully analyzes the internal logical connection between skills competitions and the teaching reform of computer-related majors in higher vocational colleges, sorts out the prominent problems in the current advancement of “integration of competition and teaching”, and proposes specific teaching reform paths from the aspects of curriculum content optimization, teaching model innovation, teaching staff construction, training base construction, and evaluation system reform.

Keywords: Skills competition; Integration of competition and teaching; Computer-related majors

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1. Introduction

Policy documents such as the “National Vocational Education Reform Implementation Plan and Opinions on Promoting the High-Quality Development of Modern Vocational Education” clearly propose that skills competitions should play a guiding role in teaching reform, and emphasize promoting “integration of posts, courses, competitions, and certificates” for comprehensive talent training to improve the quality of vocational education talent training. Therefore, in-depth research on the mechanism and paths of skills competitions, empowering the teaching reform of computer-related majors in higher vocational colleges, and transforming the advanced concepts, technical standards, and evaluation models of competitions into daily teaching resources, is of great theoretical and practical value for promoting the connotative development of computer-related majors and enhancing the adaptability of talent training^[1].

2. Internal logical connection between skills competitions and teaching of computer-related majors in higher vocational colleges

2.1. Goal consistency: Cultivating high-quality technical and skilled talents as the core

The fundamental goal of higher vocational education is to cultivate high-quality technical and skilled talents adapting to economic and social development. The purpose of skills competitions is to “promote the spirit of craftsmanship and highlight the style of vocational education”, and their competition items are directly derived from the actual projects of enterprises and the core competence requirements of posts. The two are highly consistent in the ultimate goal of talent training, that is, enabling students to master solid professional skills, possess good professional literacy and innovative ability^[2]. Competitions provide a specific and observable benchmark for achieving this goal.

2.2. Content alignment: Competition content reflects the latest industry technical standards and norms

Computer technology develops rapidly, and traditional textbooks are difficult to keep pace with the times. The competition questions of skills competitions are jointly developed by industry experts, enterprise professionals, and education experts, integrating the latest technical frameworks, development tools, post specifications, and production processes. Competition content constitutes a dynamically updated “technical mirror”, providing the most cutting-edge reference examples for teaching content.

2.3. Process practicality: Emphasizing the practical ability of “learning by doing and doing by learning”

Computer-related majors are highly practical. The competition form of skills competitions is usually team cooperation, requiring participants to complete a complete project task within a specified time, covering all links such as demand analysis, system design, coding implementation, etc^[3]. This is highly consistent with the “project-oriented and task-driven” teaching model advocated by higher vocational education. Moreover, skills competitions are more intense and demanding, serving as a comprehensive test of students’ practical ability, innovative ability, psychological quality, and team cooperation spirit^[4].

2.4. Evaluation objectivity: Providing third-party verification for teaching effects

Traditional course assessment is limited within the school with inconsistent standards. As a national unified platform, skills competitions have open and fair scoring standards, judged by industry experts. The performance of schools in competitions has become a visible and socially recognized indicator for measuring the quality of professional teaching, the level of teachers, and the competitiveness of students. This external evaluation compels schools to examine their own shortcomings and actively seek teaching reform.

3. Main problems existing in the integration of competition and teaching in computer-related majors of higher vocational colleges

3.1. Insufficient integration between skills competitions and teaching content

At present, many colleges and universities only regard skills competitions as an independent competition activity, failing to effectively integrate competition standards and content into the entire process of curriculum teaching, resulting in a disconnect between competition projects and curriculum content. The curriculum setup still focuses on theoretical knowledge systems, with an insufficient proportion of practical courses and basic content, lacking

comprehensive and innovative projects connected with competitions. Preparation for skills competitions is mostly “intensive training”, not transformed into regular teaching content, leading to the phenomenon of “separation between competition and teaching”^[5].

3.2. Lagging curriculum system, difficult to connect competitions and post requirements

The update speed of the curriculum system lags behind the iteration of information technology and the upgrading of competition projects. Currently, the curriculum setup of some majors tends to be “comprehensive but lacks focus”, squeezing the time for practical training and project actual combat, making it difficult to cultivate students’ technical expertise; the decomposition of competition projects is inadequate, failing to transform the involved knowledge points and skill points into curriculum modules integrated into core courses. This leads to a disconnect between competition skills and daily teaching, making it difficult to achieve “promoting learning through competition and promoting competition through learning”.

3.3. Insufficient “dual-qualified” literacy of teaching staff, difficult to meet the needs of teaching reform

Many computer teachers in higher vocational colleges directly take up teaching positions after graduating from universities, lacking enterprise front-line project development experience and skills competition guidance experience. They cannot decompose and reconstruct competition projects into curriculum content suitable for students’ learning, resulting in a serious disconnect between competitions and teaching. Furthermore, the two-way exchange mechanism between schools and enterprises is imperfect, teachers have few opportunities to gain experience in enterprises, and the channels for enterprise technical backbones to teach in schools and guide competitions are not smooth. The structure of the teaching staff is difficult to adapt to the needs of integrating competition and teaching^[6].

3.4. Low utilization rate of competition equipment, failing to effectively serve teaching

Various technologies in the computer field update and iterate rapidly, and the software and hardware environment required for skills competitions usually represent the high-end level of the industry. The practical training equipment of many colleges and universities is relatively outdated, unable to meet the actual needs of competition training and daily teaching. Although some colleges and universities have built training rooms with competition equipment, they are only used for intensive training of a very small number of students, while the vast majority of students cannot access high-end competition projects and advanced technologies. This causes the separation between competition and teaching, violating the original intention of promoting the overall improvement of teaching quality through skills competitions.

3.5. Single assessment and evaluation method, difficult to fully reflect students’ comprehensive abilities

Currently, the assessment and evaluation methods of computer-related majors in higher vocational colleges still focus on theoretical knowledge, with a weak assessment of students’ practical skills, professional literacy, innovative ability, and team cooperation ability. In addition, course assessment and evaluation are mostly summative evaluations based on final exams, lacking dynamic monitoring and evaluation of students’ learning processes^[7], making it difficult to timely discover problems encountered by students in the learning process. This single assessment and evaluation method not only makes it difficult to fully reflect students’ comprehensive

ability level, but also is not conducive to mobilizing students' learning enthusiasm and innovative awareness, slowing down the progress of teaching reform to a certain extent.

4. Implementation paths of skills competition empowering teaching reform of computer majors

4.1. Optimize curriculum content with skills competitions as the guide

Transform competition projects into daily teaching content, strengthen the integration between competition content and teaching content, and solve the problem of "separation between competition and teaching". Specifically, it can be carried out from the following aspects: first, systematically analyze the knowledge points, skill points, and professional literacy examined by each competition item, and integrate them into the teaching plan of corresponding courses^[8]; second, offer special elective courses or practical training courses matching competition content to help students improve their competition ability and professional skills in a targeted manner; third, introduce real competition questions and simulation questions into course practical training, course design, and even graduation design, allowing students to master relevant skills in scenarios close to reality^[9]; finally, timely adjust teaching content according to the development of industry technology and the update of competition questions, keeping teaching, competitions, and post requirements consistent.

4.2. Innovate the "three-stage and seven-step" project-based teaching model with skills competitions as the leadership

Before class, transform competition standards into three-dimensional teaching objectives. Through "decomposing competition technical documents, integrating competition training systems, and transforming competition projects", convert competition standards into the knowledge objectives, skill objectives, and quality objectives of teaching. During class, decompose the competition practical content into three-stage practical steps. Through full simulation, split "competition operation processes, competition competitive scenarios, and competition evaluation indicators" into three-stage practical steps in the teaching process. After class, extend the experience accumulated from competitions into three extended tasks. Referring to the core experience of "post-competition review and sorting, transformation of competition achievements, and cutting-edge competition technology", extend three after-class extended tasks. This link takes "competition + innovation" as the extended carrier, and can also carry out activities such as technical salons and innovation workshops to improve students' comprehensive ability and innovative awareness.

4.3. Strengthen the construction of teaching staff with skills competitions as the starting point

4.3.1. School-enterprise collaborative education, establishing a "pyramid-style" teacher team

Composed of on-campus famous teachers, enterprise experts, and competition coaches as the "top of the tower", accurately grasp the latest technical standards and development trends of competitions, formulate the long-term development direction of the teacher team and the development blueprint of teaching resources, and solve the most difficult technical problems in teaching and training. Composed of backbone teachers and enterprise engineers as the "middle of the tower", transform the "standards" of the top of the tower into specific "courses" and "projects", be responsible for the teaching of core courses, undertake the task of "mentoring", and guide the growth of young teachers. Composed of young teachers as the "base of the tower", be responsible for the

popularization of teaching of basic skill modules to ensure that students master entry-level skills^[10].

4.3.2. Strengthen teachers' practical training and improve their "dual-qualified" literacy

First, select teachers to take temporary positions and participate in on-the-job practice in leading industry enterprises to improve their practical skills and post literacy^[11]; second, organize teachers to participate in skills competition guidance training, invite skills competition experts, enterprise technical backbones, and excellent guidance teachers to carry out training on competition rules, processes, and skills to improve teachers' competition guidance ability; third, organize teachers to participate in skills competitions, encourage teachers to participate in various levels of skills competitions as contestants or guidance teachers, accumulate experience, improve skills, and understand competition dynamics and industry needs in the competition process.

4.4. Build shared and productive training bases with skills competitions as the carrier

In accordance with the idea of "integration of competition and training, integration of production and education", upgrade, adjust, and expand the functions of training bases^[12]. First, update the software and hardware equipment in training bases with reference to competition regulations. Second, break the limitation that training rooms can only be used for intensive training or classes, establish an open management method, and maximize the overall utilization rate of training rooms. Third, introduce real enterprise projects to carry out productive, practical training tasks. Enable students to participate in enterprise project development, testing, and operation and maintenance during school, making the training base not only a training ground for competitions but also a production workshop for enterprises. Fourth, build an intelligent training platform integrating virtual and real^[13]. According to the technical platform resources provided by competitions, build an online-offline integrated practical training system. Virtual simulation technology can also be used to simulate complex IT scenarios, such as large-scale data center operation and maintenance and network security attack and defense drills, to make up for the shortage of physical equipment and expand the coverage of practical teaching.

4.5. Reform the teaching evaluation system with skills competitions as the reference

4.5.1. Construct a whole-process embedded evaluation process

Before class, use intelligent learning platforms for diagnosis to identify students' knowledge blind spots and push personalized learning resources. During class, simulate the competitive environment of competitions, and adopt an evaluation method combining automatic system scoring and teacher-student process evaluation. The system conducts a relatively objective evaluation of code quality, etc., while teacher-student teams conduct process evaluation of operational standards and innovative thinking according to scoring standards. After class, implement a "standard-reaching and progressive" mechanism, conduct intelligent streaming through data analysis, arrange standard-reaching students to carry out extended training projects, and arrange non-standard-reaching students to enter personalized remediation learning channels to ensure that each student can meet the set standards.

4.5.2. Implement a diversified evaluation model involving all participants

Build an evaluation network involving teachers, enterprise mentors, and all students. Teachers are mainly responsible for evaluating students' mastery of theoretical knowledge; enterprise mentors assess students' engineering standard awareness and post-competence in real work scenarios; students deepen their understanding of evaluation standards through self-evaluation and mutual evaluation, thereby cultivating their cognitive ability

and team cooperation awareness. This structure of multiple evaluation subjects ensures the comprehensiveness of evaluation perspectives and the objectivity of evaluation results to a certain extent ^[14].

4.5.3. Create a data-driven evaluation closed-loop system

With the help of existing intelligent education platforms, real-time collection and evaluation data of students in pre-class diagnosis, in-class practice, and post-class improvement links, and generate digital portraits reflecting individual abilities after analysis. Based on these portrait data, the system can automatically identify students' learning difficulties and improvement needs, thereby pushing targeted learning plans and training resources. Teachers adjust teaching progress and content at any time according to the student learning situation analysis reports provided by the system, forming a daily teaching closed loop of “evaluation - diagnosis - feedback - improvement” ^[15], ensuring the smooth progress of teaching activities.

5. Conclusion

Skills competitions provide important direction, guidance and rich practical resources for the teaching of computer-related majors in higher vocational colleges. Deepening the integration of competition and teaching, it can drive a series of reforms in courses, teaching, teachers, practical training, evaluation, etc., and promote the rapid development of vocational education. Currently, technologies such as artificial intelligence and big data are developing rapidly, and the forms and content of skills competitions are often modified. Computer-related majors in higher vocational colleges need to closely follow the new trends of competition, build a stable and effective operation model of integrating competition and teaching, so that competition resources can truly benefit the majority of students, and effectively cultivate high-quality technical and skilled talents who can meet the needs of the digital economy era.

Disclosure statement

The authors declare no conflict of interest.

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