

Collaborative Education Mechanism for Computer Big Data Majors Under the Integration of Post-Course-Competition-Certificate

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Abstract: Against the background of rapid development of the digital economy, computer big data majors, as the core carrier for cultivating big data technical and skilled talents, are facing practical problems such as disconnection between talent training and industrial post demand, imperfect practical teaching system, and insufficient adaptability of students' comprehensive skills. As an important innovative education mode of modern vocational education and higher education, the integration of post-course-competition-certificate organically connects post demand, curriculum teaching, skill competition and vocational certificate. It is a key path to solve the dilemma of big data major talent training and realize collaborative education. By analyzing the existing problems in the talent training of computer big data majors, this paper explains the core connotation and value of the integration of post-course-competition-certificate, constructs an all-round and multi-level collaborative education mechanism, and explores specific implementation paths and guarantee systems. It aims to improve the quality of talent training for computer big data majors, cultivate high-quality technical and skilled talents meeting the needs of industrial development, and boost the high-quality development of the digital economy industry.

Keywords: Integration of post-course-competition-certificate; Computer big data major; Collaborative education; Talent training; Practical teaching

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1. Introduction

With the in-depth application of digital technologies such as big data, artificial intelligence and cloud computing, the big data industry has become the core engine of digital economy development. The demand for big data technical talents in all walks of life has exploded, and higher requirements have been put forward for talents' practical ability, post adaptability and comprehensive professional literacy. Computer big data majors cover big data technology, data science, big data management and application, and other directions^[1]. The core goal is to cultivate applied talents who have core skills such as data collection, cleaning, storage, analysis,

visualization and big data platform operation and maintenance, and can directly serve the front line of the industry^[2].

However, there are still many shortcomings in the talent training of computer big data majors in Chinese colleges and universities: the curriculum system lags behind the update speed of industrial posts, and the teaching content is disconnected from the actual work tasks of enterprises; the practical teaching link is weak, mostly based on simulated training, lacking the support of real projects and post scenarios; skill competitions are separated from daily teaching and vocational certificate assessment, failing to form an educational force; the matching degree between vocational certificates and post demand is not high, and students' ability to hold certificates for employment is insufficient^[3]. These problems lead to graduates finding it difficult to quickly adapt to enterprise post work, resulting in the contradiction between "employment difficulty" and "recruitment difficulty" of enterprises^[4].

The integrated education mode of post-course-competition-certificate is guided by post demand, takes curriculum teaching as the core, skill competition as the drive, and vocational certificate as the standard. It breaks the barriers between traditional education and industrial demand, teaching and practice, competition and certificate, and realizes the effective connection of the education chain, talent chain, industrial chain, and innovation chain^[5]. In this context, constructing a scientific and perfect collaborative education mechanism integrating post-course-competition-certificate is of great theoretical and practical significance to optimize the talent training plan of computer big data majors, improve students' core competitiveness, and promote the coordinated development of majors and industries.

2. Core connotation and educational value of the integration of post-course-competition-certificate

2.1. Core connotation

The integration of post-course-competition-certificate is a new education mode that deeply integrates and synergistically links the core ability requirements of industrial posts, professional curriculum teaching content, vocational skill competition assessment points, and vocational skill level certificate standards. Among them, "post" refers to the core post group in the computer big data industry, including big data development engineer, data analyst, big data operation and maintenance engineer, data mining engineer, data visualization engineer, etc. Clarifying the skill requirements, professional literacy and work flow of posts is the starting point of education; "course" refers to the curriculum system of computer big data majors, which is the core carrier of knowledge imparting, skill training and literacy cultivation, and the content needs to be reconstructed in close connection with the requirements of posts, competitions and certificates; "competition" refers to all kinds of big data skill competitions at all levels, which takes competitions as the starting point to test teaching achievements, stimulate students' learning enthusiasm and improve practical innovation ability^[6]; "certificate" mainly refers to 1+X vocational skill level certificates and industry authoritative certification certificates in the big data field, which are important standards to measure students' vocational skill level and important credentials for students' employment.

The four are interrelated and mutually supportive: post demand determines curriculum setting, competition content and certificate standards; curriculum teaching is the basis for meeting post demand, preparing for competitions and obtaining certificates; skill competition is the sublimation and test of curriculum teaching; vocational certificate is the quantitative evaluation of post ability and curriculum

learning. Finally, the collaborative education goal of setting courses according to posts, promoting teaching through competitions, promoting learning through certificates, and integrating courses, competitions, certificates and posts is achieved^[7].

2.2. Educational value

2.2.1. Meet the demand of industrial talents and improve post adaptability

Through in-depth investigation of the post demand of big data enterprises, the core skills of posts are integrated into curriculum teaching, competition assessment and certificate certification, so that talent training accurately connects with the front line of the industry. Students can master the practical skills required for posts during school, shorten the post adaptation period after graduation, and realize the seamless connection from campus to workplace.

2.2.2. Optimize the curriculum teaching system and strengthen the effect of practical education

Break the traditional curriculum teaching mode that emphasizes theory over practice, integrate competition projects, certificate assessment content and real enterprise projects into the classroom. Adopt project-based, case-based and task-driven teaching to enrich teaching content and forms, improve students' practical operation ability and problem-solving ability, and promote the in-depth integration of theoretical teaching and practical teaching^[8].

2.2.3. Stimulate students' learning motivation and cultivate comprehensive professional literacy

Skill competitions are competitive, practical, and innovative, which can fully mobilize students' learning initiative and team cooperation awareness; vocational certificate assessment forces students to systematically master professional knowledge and skills and cultivate a rigorous professional attitude. The combination of these two approaches not only enhances students' professional skills but also cultivates their comprehensive vocational competencies, including innovative thinking, communication and collaboration abilities, as well as stress management and adaptability.

2.2.4. Promote school-enterprise collaborative education and deepen industry-university integration

The integration of post-course-competition-certificate requires enterprises to deeply participate in the whole process of talent training, from post investigation, curriculum development, competition proposition, certificate assessment to training base construction and teacher training^[9]. Schools and enterprises form a collaborative linkage mechanism to realize resource sharing and complementary advantages, further deepen industry-university integration and school-enterprise cooperation, and improve the quality of professional running.

3. Existing problems in the talent training of computer big data majors

3.1. Disconnection between curriculum system and post demand, outdated content

At present, the curriculum system of computer big data majors in some colleges and universities still follows the setting mode of traditional computer majors. The curriculum content focuses on theoretical knowledge, with less involvement in cutting-edge big data technologies and enterprise practical application scenarios; the

curriculum setting does not fully investigate the skill iteration speed of core posts in the big data industry, and the teaching update of core technologies such as big data frameworks including Hadoop, Spark, Flink, Python data processing, machine learning and data security is not timely. As a result, there is a big gap between what students have learned and the actual needs of enterprise posts, which makes it difficult to meet the needs of industry development^[10].

3.2. Imperfect practical teaching system and insufficient training resources

Practical teaching is the core link of big data major talent training, but most colleges and universities have weak practical teaching links: the configuration of training equipment and software lags behind the actual application environment of enterprises, lacking real big data clusters and massive data training resources; practical teaching is mostly based on verification experiments, lacking the drive of real enterprise projects, and students are difficult to contact the whole process of data collection, cleaning and analysis in actual work; the construction of off-campus training bases is imperfect, school-enterprise cooperation is a mere formality, and students are difficult to enter enterprises to carry out immersive post practice, resulting in poor effect of practical ability training.

3.3. Separation of post-course-competition-certificate, failure to form educational force

On the one hand, skill competitions are disconnected from daily teaching. Most competitions are participated in by a few outstanding students, adopting the centralized training mode, which does not match the conventional curriculum teaching content, failing to realize the full coverage of promoting teaching and learning through competitions; on the other hand, vocational certificate assessment is disconnected from curriculum teaching and post demand^[11]. Some certificate assessment content focuses on theory with insufficient practical operation, and curriculum teaching does not integrate certificate assessment points in a targeted manner, resulting in students' separate certificate examination and learning; at the same time, post demand has not been effectively transformed into the core standards of courses, competitions and certificates, and there is no effective linkage between the four, unable to form a collaborative education force.

3.4. Insufficient Practical Ability of Teachers and Inadequate Depth of School-Enterprise Collaborative Education

Most teachers of computer big data majors teach directly after graduating from colleges and universities, lacking actual work experience in enterprise big data posts. They do not thoroughly grasp the industry's cutting-edge technologies and practical processes, making it difficult to carry out high-quality practical teaching and competition guidance^[12]; at the same time, school-enterprise cooperation mostly stays on the surface, enterprises are not enthusiastic about participating in talent training, and a long-term school-enterprise collaborative education mechanism has not been established. Enterprise tutors, real projects and industry resources have not been effectively integrated into the whole teaching process, restricting the promotion of integrated education of post-course-competition-certificate^[13].

3.5. Single evaluation and assessment system, difficult to comprehensively measure talent quality

The traditional talent training evaluation system is mainly based on theoretical examinations, focusing on the assessment of knowledge memory, ignoring the comprehensive evaluation of students' practical skills,

professional literacy, innovation ability, competition achievements and certificate acquisition. It cannot comprehensively measure students' post adaptability and comprehensive literacy, nor can it provide feedback on teaching quality, which is not conducive to the implementation of the integrated education mode of post-course-competition-certificate^[14].

4. Construction of collaborative education mechanism for computer big data majors under the integration of post-course-competition-certificate

4.1. Post-oriented demand docking mechanism

Centering on the demand of core post groups in the big data industry, establish a school-enterprise joint post investigation mechanism^[15]. Regularly organize college teachers, enterprise technical backbones and industry experts to go deep into big data enterprises to investigate the job responsibilities, skill requirements, professional literacy standards and technology development trends of core posts such as big data development, data analysis and big data operation and maintenance. Sort out the core ability map of posts, transform it into the core goals of professional talent training, clarify the ability training priorities of curriculum teaching, skill competitions and vocational certificates, and realize the accurate docking of talent training and post demand.

At the same time, establish a dynamic update mechanism of post demand, keep up with the technology iteration and industrial upgrading of the big data industry, timely adjust post ability requirements, and synchronously update curriculum content, competition projects and certificate assessment standards to ensure that talent training always meets the needs of industrial development.

4.2. Curriculum reconstruction mechanism for interworking of course-competition-certificate-post

Based on post ability and certificate standards, taking competition projects as the carrier, reconstruct the computer big data professional curriculum system of “shared at the bottom, separated in the middle, and integrated at the top”, so as to realize the deep integration of course, competition, certificate and post.

4.2.1. Basic curriculum layer

Focus on the general basic knowledge of big data majors, integrate the basic assessment content of vocational certificates and the necessary theoretical knowledge of competitions. Offer courses such as Introduction to Big Data, Python Programming, Database Principles, and Computer Networks to consolidate students' theoretical foundation and lay a solid foundation for subsequent professional learning, competition preparation and certificate examination.

4.2.2. Core Curriculum Layer

Closely connect with core post skills and certificate assessment points, correspond core courses such as Big Data Technology Principles, Hadoop Big Data Development, Spark Data Processing, Data Mining and Analysis, Data Visualization, and Big Data Security with the assessment content of 1+X Big Data Vocational Skill Level Certificate and industry authoritative certificates one by one. At the same time, integrate the core projects and practical tasks of skill competitions to realize the seamless connection between curriculum content and posts, competitions and certificates.

4.2.3. Practical expansion curriculum layer

Take real enterprise projects, real skill competition questions and comprehensive certificate training as the core, offer courses such as project training, competition training and enterprise post practice. Adopt the school-enterprise dual-tutor system to let students complete post work tasks in real scenarios, improve practical ability and comprehensive literacy, and realize the transformation from knowledge learning to skill application.

4.3. Ability improvement mechanism of competition-teaching integration

Construct a three-level competition-teaching integration mechanism of “popularization + improvement + competition” to realize the full coverage of skill competitions and drive teaching reform and student ability improvement through competitions.

4.3.1. University-level popularization competition

Integrate competition content into daily curriculum teaching, carry out university-level big data skill competitions every semester for all students. The competition content is closely linked to the core knowledge points and basic skills of the curriculum to stimulate the learning interest of all students and test the basic teaching achievements.

4.3.2. Provincial-level improvement competition

Select outstanding students to form a competition team, jointly guided by school-enterprise dual tutors. Carry out special training around the requirements of provincial-level big data skill competitions, integrate the difficulties and innovation points of competitions into professional core courses, and improve students' comprehensive practical ability and innovative thinking.

4.3.3. National-level competitive competition

Connect with high-level competitions such as the National Vocational College Skills Competition and China International “Internet +” College Students Innovation and Entrepreneurship Competition. Focus on cutting-edge technologies and complex projects in the big data industry to cultivate students' team cooperation, technical research and innovation application ability. At the same time, transform excellent competition results into teaching cases to feed back daily teaching.

4.4. Certificate-course connection assessment and evaluation mechanism

Establish a diversified comprehensive evaluation system of “course assessment + certificate certification + competition evaluation + post practice” to comprehensively measure students' learning achievements and professional abilities.

4.4.1. Course assessment

Break the single theoretical examination mode, adopt the combination of process assessment and summative assessment. Process assessment covers classroom tasks, training projects, group assignments, etc. Summative assessment focuses on practical skills and comprehensive application, with the proportion of results tilted to practical links.

4.4.2. Certificate certification

Incorporate the acquisition of 1+X Big Data Vocational Skill Level Certificate and industry authoritative certificates into the credit system. Students can exchange course credits for corresponding certificates, forcing them to take the initiative to learn and improve their professional skills.

4.4.3. Competition evaluation

Include students' awards in skill competitions at all levels in the comprehensive evaluation, give corresponding credits and rewards, and encourage students to prepare for and participate in competitions actively.

4.4.4. Post-practice evaluation

Enterprise tutors evaluate students' post performance, practical ability and professional literacy in post practice and project practice, accounting for a certain proportion of the comprehensive score, realizing the connection between evaluation and post demand.

4.5. School-enterprise collaborative resource sharing mechanism

Build a resource sharing platform for in-depth school-enterprise cooperation, integrate university and enterprise resources, and provide all-round support for the integrated education of post-course-competition-certificate.

4.5.1. Teacher sharing

Establish a school-enterprise dual-teacher mutual employment mechanism. On the one hand, select university teachers to take temporary posts in enterprises, participate in the research and development of actual enterprise projects, and improve practical ability; on the other hand, employ enterprise technical backbones and industry experts as part-time teachers to undertake practical curriculum teaching, competition guidance, certificate training, etc., to build a double-qualified teaching team.

4.5.2. Training resource sharing

Schools and enterprises jointly build on-campus big data training bases, introduce real enterprise equipment, software and massive data resources, and build a training environment consistent with enterprise posts; at the same time, rely on enterprises to build off-campus post practice bases to provide real post practice scenarios for students.

4.5.3. Teaching resource sharing

Schools and enterprises jointly develop teaching resources such as curriculum textbooks, training manuals, teaching cases and competition question banks. Integrate real enterprise projects, real competition questions and certificate assessment content into teaching resources to improve the practicality and pertinence of teaching resources.

5. Implementation path of collaborative education mechanism for the integration of post-course-competition-certificate

5.1. Deepen school-enterprise cooperation and consolidate the educational foundation

Colleges and universities should take the initiative to connect local and regional big data industrial parks and

leading big data enterprises, sign in-depth school-enterprise cooperation agreements, and establish a long-term cooperation mechanism. Set up a professional construction steering committee composed of colleges and universities, enterprises and industry associations to participate in the whole process of talent training plan formulation, curriculum system reconstruction, teaching content update, training base construction, assessment and evaluation to ensure that talent training always revolves around post demand. At the same time, enterprises provide training equipment, technical support, project resources and employment posts for colleges and universities, and colleges and universities deliver customized talents for enterprises to realize win-win cooperation between schools and enterprises.

5.2. Reconstruct the curriculum system and promote the integration of course-competition-certificate-post

According to the post ability map, certificate and competition standards, integrate and optimize the existing courses, eliminate outdated content, and integrate cutting-edge big data technologies, enterprise practical cases, competition projects and certificate examination points. Compile characteristic textbooks integrating post-course-competition-certificate, integrating theoretical knowledge, skill operation, competition skills and certificate assessment points; adopt new teaching modes such as project-driven, case teaching and online-offline mixed teaching, disassemble real enterprise projects into curriculum tasks. Let students master knowledge and skills in the process of completing projects, and take into account competition preparation and certificate assessment.

5.3. Strengthen the construction of double-qualified teachers and improve teaching and guidance ability

Formulate a double-qualified teacher training plan, regularly organize professional teachers to participate in big data industry technical training, 1+X certificate teacher training and skill competition guidance training. Encourage teachers to participate in enterprise horizontal projects and project research and development to improve practical teaching and competition guidance ability. Establish an enterprise tutor employment and management mechanism, clarify the job responsibilities and assessment standards of enterprise tutors, regularly carry out teaching method training to improve the teaching level of enterprise tutors, and build a high-level teaching team with solid theoretical foundation, outstanding practical ability, and a combination of full-time and part-time teachers.

5.4. Improve training conditions and build a practical education platform

Increase investment in training base construction, jointly build a big data training center and a big data application research and development center with enterprises. Configure big data clusters such as Hadoop and Spark, introduce mainstream industry tool software such as Python, SQL and Tableau, and build a simulated training environment consistent with enterprise posts. Establish a training resource library, collecting real enterprise projects, real competition questions, certificate training cases, teaching videos, and other resources to support students' independent learning, competition preparation, and certificate examination. At the same time, expand off-campus training bases and arrange students to enter enterprises for post practice to improve their practical ability and professional literacy in real posts.

5.5. Optimize the evaluation system and guarantee the educational quality

Establish a diversified, process-oriented and comprehensive talent training evaluation system, which includes students' curriculum scores, certificate acquisition, competition awards, post practice and professional literacy into the evaluation scope. Implement the combination of process evaluation and summative evaluation, school evaluation and enterprise evaluation, teacher evaluation and student self-evaluation and mutual evaluation. At the same time, establish a teaching quality feedback mechanism, regularly collect feedback from enterprises, students, and teachers, timely adjust talent training plans, curriculum content, and teaching methods, and continuously optimize the effect of integrated education of post-course-competition-certificate.

6. Guarantee system of collaborative education mechanism

6.1. System guarantee

Colleges and universities formulate a special management system for integrated education of post-course-competition-certificate, clarify the standards and norms of school-enterprise cooperation, teacher construction, curriculum reform, training management, assessment and evaluation, credit recognition, etc., to provide institutional support for the implementation of the collaborative education mechanism. At the same time, include the integration of post-course-competition-certificate into professional construction and the teacher performance appraisal system to stimulate teachers' enthusiasm for participating in the reform.

6.2. Funding guarantee

Increase funding investment, set up a special fund for the integration of post-course-competition-certificate, used for training base construction, teaching resource development, teacher training, skill competition holding, school-enterprise cooperation and exchange, etc. Actively strive for government special fund support and enterprise sponsorship, broaden funding sources, and ensure the smooth development of education work.

6.3. Technical guarantee

Keep up with the development trend of big data industry technology, timely update training equipment and software, introduce cutting-edge industry technologies and tools, build an information-based teaching platform and an online training platform to provide convenient learning and training conditions for students. At the same time, rely on industry associations and enterprises to obtain the latest technical standards, post demand and industry dynamics to ensure the advancement of talent training.

6.4. Organizational guarantee

Set up a leading group for collaborative education integrating post-course-competition-certificate, composed of school leaders, enterprise principals, professional leaders and backbone teachers to overall plan the education work and coordinate and solve problems in the implementation process. Clarify the job responsibilities of each department, forming a work pattern of division of labor, collaboration and joint management by the Academic Affairs Office, secondary colleges, training centers and school-enterprise cooperation offices.

7. Conclusion

The integration of post-course-competition-certificate is an inevitable choice for computer big data majors to innovate talent training mode and improve talent training quality. Constructing a scientific and perfect

collaborative education mechanism is the key to solving the current talent training dilemma and realizing the coordinated development of majors and industries. By establishing five core mechanisms, including post-oriented demand docking, curriculum reconstruction of interworking course-competition-certificate-post, ability improvement of competition-teaching integration, assessment and evaluation of certificate-course connection, and school-enterprise collaborative resource sharing, and supporting perfect implementation paths and guarantee systems, we can effectively break the barriers between education and industry, teaching and practice, competition and certificate. We can realize setting courses according to posts, promoting teaching through competitions, promoting learning through certificates, and cultivating big data technical and skilled talents with solid theoretical knowledge, excellent practical skills, and good professional literacy.

In the future, colleges and universities need to continue to deepen school-enterprise cooperation, keep up with the development trend of the big data industry, continuously optimize the collaborative education mechanism integrating post-course-competition-certificate, and promote the resonance of professional construction and industrial demand. We will deliver more high-quality compound big data talents for the development of the digital economy and boost the high-quality development of China's big data industry. At the same time, the integrated education mode of post-course-competition-certificate needs to be continuously explored and improved in practice. Combined with the school-running positioning and professional characteristics of different colleges and universities, form a personalized and characteristic education path to promote the continuous deepening of education and teaching reform of computer big data majors.

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