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Construction of an Innovative Talent Training System for the Big Data Technology Major under the Background of "Artificial Intelligence + Emerging Engineering"

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Abstract: With the rapid development of artificial intelligence and big data technology, the demand for professional talents in related industries has grown sharply, and the training of talents in the big data technology major has shown the characteristics of multi-disciplinary and multi-field integration. Aiming at the dilemmas faced in the training of innovative talents in the big data technology major, this paper discusses from aspects such as "promoting interdisciplinary communication and improving interdisciplinary literacy; reconstructing the curriculum system and formulating professional curriculum standards; strengthening the construction of the teaching staff; deepening the integration of innovation and entrepreneurship education with professional education; improving practical training conditions and enriching practical training resources". To cultivate innovative talents and closely follow the requirements of emerging engineering talent training, it aims to construct a set of innovative talent training systems suitable for the big data technology major.

Keywords: Artificial intelligence; Emerging engineering; Big data technology major; Innovative talent training system

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1. Introduction

In the context of the rapid development of science and technology, artificial intelligence has become a new engine driving global economic and social development. In 2018, the "Action Plan for Artificial Intelligence Innovation in Higher Education Institutions" issued by the Ministry of Education pointed out that attention should be paid to the intersection and integration of artificial intelligence with the education of computer, control and other disciplines, and the exploration of the "artificial intelligence + X" talent training model. The "2024 Government Work Report of the State Council" proposed to deepen the R&D and application of big data, artificial intelligence, etc., carry out the "artificial intelligence +" action, and build an internationally competitive digital industrial cluster. In the field of education, the application of artificial intelligence not only provides effective support for optimizing teaching methods but also accelerates the integration and innovation of cutting-edge digital technologies such as big data and artificial intelligence. To support industrial transformation and upgrading and enhance national competitiveness, China attaches great importance to the construction of emerging engineering and is committed to cultivating diversified and innovative engineering talents. As an important part of emerging engineering, promoting the integration of artificial intelligence with other disciplines has become an important direction of education reform.

2. Current practical dilemmas in the training of innovative talents in the big data technology major

2.1. Difficulties in interdisciplinary integration

Traditional universities have clear disciplinary divisions and management barriers between colleges. The curriculum system design lacks sufficient interdisciplinary connections, resulting in knowledge transmission gaps. Although some universities have set up integrated courses, the teaching content is still dominated by educators from a single discipline, failing to truly reflect multi-disciplinary collaboration [1]. For example, mathematics courses focus on formula derivation, lacking combination with real data scenarios; programming courses emphasize grammar training, ignoring the actual needs of data processing; statistical modeling courses are divorced from industry backgrounds, making it difficult for students to understand the practical value of models. This fragmented teaching weakens students' overall cognitive ability to solve complex problems. The difficulty of interdisciplinary integration is not only reflected in the curriculum level but also affects the quality and adaptability of talent training at a deeper level. Faced with the urgent demand for compound talents in the industry, the current education model has not fully broken through disciplinary boundaries, restricting the growth space of innovative talents.

2.2. Lagging update of teaching content

Under the general trend of in-depth integration of artificial intelligence, emerging issues such as data governance, privacy protection, and algorithmic fairness have not been fully incorporated into the curriculum modules, limiting students' cognitive breadth of technical ethics and social responsibilities [2]. At the same time, industry application scenarios show highly diversified characteristics. Fields such as financial risk control, medical and health care, intelligent manufacturing, and smart cities have different application logics and technical paths for big data technology, and the required skill combinations also have significant differences. However, the existing teaching models generally adopt unified curriculum settings, lacking targeted training mechanisms for segmented industries, making students need a long adaptation period when entering specific positions [3]. If the update rhythm of teaching content cannot keep up with the pace of technological change, it will be difficult to support the training goal of high-quality, practical and innovative big data talents in the background of "artificial intelligence + emerging engineering".

2.3. Weak professional teaching staff

As an interdisciplinary subject integrating computer science, statistics, artificial intelligence, and industry applications, big data technology puts forward higher requirements for educators' knowledge breadth and practical ability [4]. However, most educators in related majors at current universities lack a systematic interdisciplinary background. Some educators have transformed from traditional computer or information majors and have not mastered core content such as data mining, machine learning, and distributed computing in depth, making it difficult to support high-quality professional teaching. Some universities have not formed a reasonable talent echelon, with a low proportion of young and middle-aged backbone educators and an insufficient number of senior title educators. Some majors even rely on a few core educators to undertake the main teaching tasks, and long-term overloading affects teaching quality and scientific research investment. Although new educators have a certain theoretical foundation, they generally lack enterprise practical experience and struggle when teaching practical courses such as data cleaning, real-time processing, and big data operation and maintenance [5].

2.4. Underdeveloped practical resources

At present, some universities have obvious shortcomings in the allocation of practical teaching resources. The construction of big data laboratories requires high-performance server clusters, stable network environments, and large-scale data set support, as well as the deployment of distributed frameworks such as Hadoop and Spark and related management platforms, resulting in huge investments in software and hardware [6]. Equipment procurement, system construction and later operation and maintenance all require continuous financial support, which is a heavy burden for local universities with limited funds. Even if some schools build laboratories, their utilization rate is low due to maintenance difficulties. The data processing process in real enterprise scenarios is highly complex and dynamic, but most laboratories lack a technical ecosystem synchronized with the industrial front line. Experimental projects mostly stay at the basic verification level, and it is difficult to simulate the needs of high concurrency, heterogeneous data integration and real-time decision-making in actual business [7]. The data sets used in the teaching process are often public static samples, lacking industry backgrounds and practical problem drivers, leading to students still feeling unfamiliar when facing real projects.

3. Strategies for constructing an innovative talent training system for the big data technology major under the background of "Artificial Intelligence + Emerging Engineering"

3.1. Promote interdisciplinary communication and improve interdisciplinary literacy

Under the background of "artificial intelligence + emerging engineering", the development of the big data technology major shows the characteristics of high integration and interdisciplinary integration. This trend requires the education system to break through traditional disciplinary barriers and build an open and collaborative talent training mechanism [8]. Universities should take the initiative to integrate resources in fields such as computer science, statistics, artificial intelligence, information management, engineering and even social sciences, regularly organize interdisciplinary seminars around the application scenarios of big data technology, provide a platform for in-depth dialogue between educators from different colleges and departments, encourage them to participate in special lectures, joint research workshops and short-term training programs, and systematically understand the research paradigms, technical needs and data characteristics of other disciplines, so as to accurately grasp the key issues and development directions of interdisciplinary fields [9].

The achievements of interdisciplinary communication should be transformed into classroom teaching resources, allowing students to come into contact with problem scenarios in practical fields such as intelligent manufacturing, smart medical care, and digital governance while learning core technologies such as data collection, cleaning, storage, analysis, and visualization. To this end, educators can introduce interdisciplinary projects based on real needs in teaching, guide students to complete the whole process of practice from problem definition to solution output in teams, understand the differences in language and thinking modes of different disciplines in collaboration, learn to use big data technology to solve complex problems in non-computer fields, exercise systematic thinking and innovative design capabilities, and provide solid support for the growth of talents in the big data technology major.

3.2. Reconstruct the curriculum system and formulate professional curriculum standards

The reconstruction of the curriculum system should focus on the entire chain of data collection, processing, analysis and intelligent decision-making, integrate core artificial intelligence technology modules, add courses such as machine learning, deep learning, natural language processing and computer vision, and strengthen students' practical capabilities in algorithm design, model training and optimization [10]. The design of curriculum content should reflect cutting-edge and practicality, timely introduce mainstream industry tool platforms and open-source frameworks, and enhance students' engineering implementation capabilities. Project-driven teaching should run through the curriculum implementation process, set up analysis tasks on real data sets and intelligent system development projects, and guide students to understand the key links of data modeling and algorithm tuning in practice. There should be a logical progressive relationship between curriculum modules: basic courses consolidate mathematical and programming capabilities, core courses focus on data analysis and intelligent algorithms, and extended courses target typical application scenarios such as smart cities, intelligent manufacturing and financial technology, constructing a curriculum ecosystem with clear levels and reasonable structure [11].

The formulation of professional curriculum standards is a core link to ensure teaching quality. Universities should jointly establish a curriculum committee with leading industry enterprises and technical experts, conduct systematic analysis based on job competency maps, and clarify the specific requirements of different positions for skills such as data cleaning, feature engineering, model deployment and system operation and maintenance. Then, decompose these vocational competency indicators into the teaching objectives of each course to form quantifiable and assessable learning outcome standards [12]. Curriculum standards should clearly specify knowledge objectives, ability objectives, and quality objectives, and refine elements such as teaching content, class hour allocation, practice proportion, and assessment methods to ensure that the teaching process is evidence-based. In addition, a dynamic adjustment mechanism should be embedded in the management of curriculum standards. Regularly collect graduate employment feedback, enterprise employment evaluations and technical development trend reports, iterate and update the curriculum content and standards to keep them synchronized with industrial development.

3.3. Deepen the integration of innovation and entrepreneurship education with professional education

The teaching staff is the core support of the talent training system. Under the background of "artificial intelligence + emerging engineering", the development of the big data technology major puts forward higher requirements for educators' professional capabilities, interdisciplinary literacy, and practical experience. It is necessary to optimize the academic structure, title structure and professional background configuration of the teaching staff according to the cutting-edge trends of the discipline and the direction of industrial development, introduce high-level talents with interdisciplinary backgrounds or engineering practice experience, and form a teaching staff pattern of multi-disciplinary collaboration and complementary advantages [13].

Specifically, teaching innovation teams oriented by curriculum groups or projects should be established around key application directions of big data technology, such as intelligent analysis, data governance, and edge computing. Team members conduct collective lesson preparation, joint teaching, and educational reform research based on common technical fields and teaching objectives, realizing the organic connection of knowledge systems and the dynamic update of teaching content. By establishing a modular teaching mechanism, the barriers between traditional majors are broken, and educators' collaborative capabilities in teaching complex engineering problems are improved. Educators are encouraged to participate in cross-college scientific research projects and industrial cooperation projects, enhance their ability to solve technical problems in real scenarios, and thus provide feedback on classroom teaching [14].

Integrate innovation and entrepreneurship education into the whole process of professional teaching, and set up special funds to support students in carrying out innovative experiments, technology incubation, and entrepreneurial practice. Organize educators to guide students to participate in vocational skills competitions, innovation and entrepreneurship competitions, and other activities, and exercise students' independent inquiry ability and team collaboration spirit in project execution. Offer innovation and entrepreneurship courses integrated with professional content to guide students to think about the whole cycle from technical prototypes to product landing. Educators should simultaneously improve their own innovation and entrepreneurship guidance capabilities in the guidance process, forming a good ecology of mutual promotion between professional teaching and innovative education.

3.4. Improve practical training conditions and enrich practical training resources

Big data technology involves multiple technical modules such as massive data storage, distributed computing, data mining and visualization. The practical training environment must be equipped with high-performance servers, cloud computing platforms, distributed storage systems and mainstream big data frameworks. A complete technical stack should be deployed at the software level to ensure that students can complete end-to-end project training in a real technical ecosystem [15].

First, introduce industry-level database resources. By cooperating with enterprises to access desensitized data sets in fields such as finance, medical care, transportation and e-commerce, students can carry out data analysis tasks in an environment close to real business scenarios. These data have the characteristics of large scale, diverse structure and strong dynamics, which help to cultivate students' ability to handle complex data problems. The construction of a typical industry case library is also indispensable. For example, project cases such as urban traffic flow prediction, user portrait construction, and intelligent recommendation system development can help students understand the technical selection logic and engineering implementation path in different application scenarios. Cases should be accompanied by complete project documents, data descriptions, and technical guidance to support students' independent inquiry and team collaboration.

Second, promote students' participation in real industry projects. Universities can transform actual enterprise needs into operable teaching projects through forms such as school-enterprise co-built laboratories, joint R&D centers, or industrial colleges. Under the joint guidance of tutors and enterprise engineers, students participate in the whole process from demand analysis and scheme design to system deployment, mastering project management methods and team collaboration skills in practice. Some outstanding students can also intern in enterprises, directly undertaking tasks such as data governance and model optimization, and accumulating front-line work experience.

Furthermore, the construction of virtual simulation platforms and online practical training systems further expands the space and time boundaries of practical teaching. Cloud-based practical training platforms support remote access, allowing students to carry out experimental operations anytime and anywhere. The system automatically records operation logs and provides intelligent feedback. The platform integrates functions such as task release, code submission and result evaluation, realizing the whole-process digital management. Through multi-dimensional resource integration and multi-level practical design, the practical training system gradually transforms from simulation exercises to real delivery, effectively improving students' comprehensive ability to solve complex engineering problems.

4. Conclusion

Driven by the construction of emerging engineering, the big data technology major aims to cultivate compound talents proficient in big data technology theory and artificial intelligence theory, with practical skills and familiarity with the digital economy knowledge system. To achieve this goal, it is necessary to continuously optimize the curriculum system, deepen the integration of production, teaching, research, and application, enhance students' innovation and entrepreneurship capabilities, comprehensively optimize the innovative talent training system for the big data technology major, and deliver more applied, innovative, and compound high-quality talents to the industry.

Disclosure statement

The authors declare no conflict of interest.

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