Thoughts on Talent Training of Data Science and Big Data Technology in Local Agricultural Colleges
—Take Tianjin Agricultural University as an example

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ABSTRACT: In order to cultivate high-quality applied talents for data mining and analysis in the field of agricultural big data, taking the training of data science and big data technology professionals in the School of Computer, Tianjin Agricultural College as an example,   the article in-depth explores of the training of big data talents in the agricultural field from five aspects: first, the necessity of adding professional establishment, second, professional training positioning, third teaching system construction , fourth, the construction of the teaching staff ,fifth, the construction of a practice teaching platform both inside and outside the school. It hopes that through practice with a view to continuously improve even excellent , and then promote   it in similar the professional field of related colleges and universities .

1. Introduction

The "Outline of Action for Promoting Big Data Development" issued by the State Council in August 2015 clearly states : " Comprehensively promote the development and application of China's big data . The number of Internet and mobile Internet users in China ranks first in the world, with rich data resources and application market advantages , Breakthroughs in the research   and development of some key technologies in big data, and a number of Internet innovative companies and innovative applications have emerged , Some local governments have started related work on big data. Besides, adhere to innovation-driven development, accelerate big data deployment, and deepen big data applications has become an inherent need and inevitable choice for stabilizing growth, promoting reform, restructuring, benefiting people's livelihood, and promoting the modernization of government governance capabilities. At the same time big data has become a new driving force for economic transformation and development, new opportunities to reshape the country's competitive advantage and new approach to promote government governance . Increasing settings Data Science and Big Data Technology profession , cultivating   big data professionals as specialized data engineers   and so on , are of great significance to serve the national strategy and promote economic transformation and economic development."[1]

2. Necessity of adding data science and big data technology majors in Tianjin Agricultural University

With the rapid development of information technology and economy, especially the explosive growth of the amount of data collected, stored, and analyzed by the widespread application of networks, mobile devices, and IoT sensors, data at an alarming rate is becoming a national basic strategy resources. Big data has penetrated into various fields and industries, and has had an important impact on global production, consumption, economic operating systems, social lifestyles, and national governance capabilities. [2] The 2016 China Internet Hottest Talent Report shows that

R & D engineers, product managers, human resources, marketing, operations, and data analysis are the six most demanding talent positions in China's Internet industry today. [3] Among them, R & D engineers have the largest demand, and data analysis talents are the scarce. At the same time, through consulting the data, it is not difficult to find that in 2017, the first batch of data science and big data technology majors in China were only Peking University, University of International Business and Economics, and Central South University. In 2018, 250 universities were approved to open in this specialty, the quantity is in a state of blowout. In this context, as the only agricultural college in Tianjin, setting up the "Data Science and Big Data Technology" major in a timely manner, and shoulders an important responsibility for cultivating big data application technical personnel for Bohai Rim modern urban agriculture.

3. Professional Training Positioning

Tianjin Agricultural University is a local undergraduate institution, with the goal of cultivating applied talents. It has a discipline support by statistics, mathematics, and computers, at the same time which having biology, environmental science, and management ect three Application expand discipline system. There are four undergraduate majors in college ,mainly contains information management and information system, computer science and technology, software engineering and Internet of things engineering, supporting the construction of data science and big data technology majors. The cultivate orientation of this major is: facing the development of data science and big data industries and the needs of urban modern agricultural applications, cultivating the comprehensive development of moral, intellectual, physical, aesthetic, and labor; cultivate the system to master the basic theory of big data analysis and processing technology, basic mastery of big data collection, processing, analysis and application technology, having the practical engineering ability of big data platform management and maintenance.Besides, composite application talents who can undertake big data management, analysis, and integration and management of big data systems in government, enterprises, and institutions, especially high-quality application talents who can perform data mining and analysis in the field of agricultural big data.

4. Construction of Teaching System

4.1 Curriculum Architecture

Guided by the national standards of undergraduate professional teaching quality and engineering education quality , following the basic principles of the curriculum system that must support the effective achievement of various graduation requirements, and ensure the effective realization of professional training goals, follow the "oriented agricultural applications, highlight their own characteristics, disciplines Cross-integration, adapting to long-term needs" to cultivate the characteristics of application-oriented professional talents, and build a professional curriculum system, as shown in Figure 1.
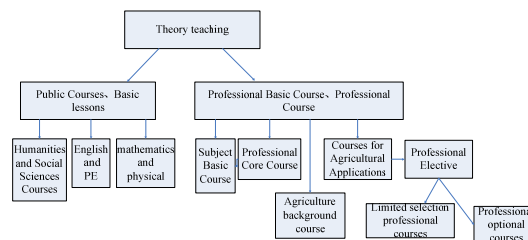

Figure 1 Professional curriculum system

It consists of four parts: the first part, humanities and social sciences, English, and physical education: accounting for about 20.7%, enable students to consider economic, environmental, legal, ethical and other constraints when engaging in engineering design [4]. Part II: Mathematics and Physics: accounting for about 15.5%，to enable students to master theoretical and experimental

methods, and to lay the foundation for students to express engineering problems, choose appropriate mathematical models, and analyze and reason. Mainly contains: advanced mathematics (upper and lower), linear algebra, discrete mathematics, probability theory and mathematical statistics, university physics. The third part is the basic and professional courses: accounting for about 28.2%, which can reflect the training of mathematics and natural sciences in this specialty, the training of system design and practical ability. Major courses: object-oriented programming, database system principles, computer networks, operating systems, algorithm analysis and design, data collection technology, big data query and processing, multivariate statistical analysis, and R language modelling. These core courses are basically similar to the core courses offered by other universities' data science and big data technology majors. In addition, in order to highlight the characteristics of agricultural colleges and universities, in the curriculum setting, some agricultural application background courses such as "Introduction to Agricultural Information Technology" are provided to allow students to systematically understand the planting, aquaculture, aquatic product, food processing knowledge, to understand agriculture, love farmers, love the countryside, and lay a good foundation for engaging in future research and development of big data systems, big data application development and big data analysis in the field of agriculture. The fourth part makes a article in the professional (foundation) class. Under the premise of ensuring that the total teaching hours do not exceed the standard, while taking into account the different needs of students, 20 additional elective courses are set up, and students can freely choose according to their need of further education and employment. The credits for this part of the course are Non-mandatory for students.

4.2 Practical Teaching System Architecture

Cultivation of practical ability does not happen overnight. It is necessary to start from the entrance of new students and build a multi-level and progressive practical teaching system, including professional cognitive practice, curriculum design, curriculum group application training, and enterprise-level practice. Through different practical links the continuous deepening exercise gradually implements the practical teaching goals. For many years, in the course of software talents training, our college has constructed a five-level, progressive practice teaching structure in accordance with the four-level engineering practice ability training model. The practice effect is very significant and has been used to this day. Drawing on the results of software talent training, a practical teaching system structure for data science and big data technology majors is constructed, as shown in Figure 2.
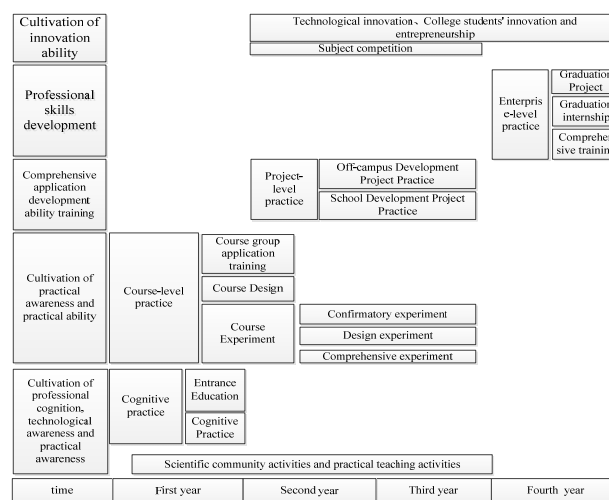

Figure 2 Five-level step-by-step practical teaching

5. teachers team construction

In recent years, through the combination of external introduction and internal training, the combination of academic qualification improvement and business ability training has initially

formed a team of teachers supporting professional teaching and scientific research. There are 13 professional teachers, including 4 professors and 2 associate professors. There are 5 teachers with doctoral degree and 2 teachers working for doctoral degree. Basically meet the needs of data science and big data technology teaching and internship. In the next 2-3 years, we will strive to introduce two high-level teachers with industry background, and constantly strengthen the masters team to consolidate the teachers.

6. Construction of practice teaching platform inside and outside the school

Since 2013, two types of platforms have been constructed. The first is an experimental training platform on campus, which mainly includes the Agricultural Internet of Things Technology Laboratory, 3S and Precision Agriculture Laboratory, Multimedia Technology and Application Laboratory, Computer Network and Communication Laboratory, Microcomputer principle and control laboratory, software engineering application and innovation laboratory, one municipal experimental teaching demonstration center. The second is a interchangeable off-campus project and development training platform, which mainly includes enterprises such as Tianjin Rongchuang Softcom Technology Co., Ltd., Beijing Lingyang Aipu Technology Co., Ltd., Tianjin Fenghuo Zhengtu Technology Co., Ltd. , Tianjin Aiying Technology Co., Ltd., etc .; Make clear The functional positioning of various platforms in practical teaching, as well as the effective connection between different platforms, to ensure that practical teaching advances gradually from shallow to deep, from simple to comprehensive. As shown in Figure 3.
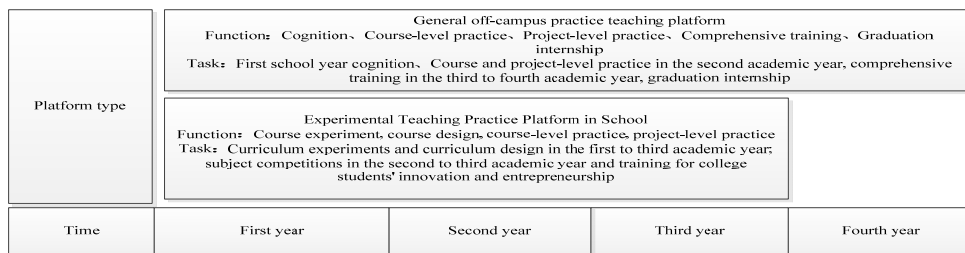
Platform type	General off-campus practice teaching platform Function：Cognition、Course-level practice、Project-level practice、Comprehensive training、Graduation internship Task：First school year cognition、Course and project-level practice in the second academic year, comprehensive training in the third to fourth academic year, graduation internship			
	Experimental Teaching Practice Platform in School Function：Course experiment、course design、course-level practice、project-level practice Task：Curriculum experiments and curriculum design in the first to third academic year; subject competitions in the second to third academic year and training for college students' innovation and entrepreneurship			
Time	First year	Second year	Third year	Fourth year

Figure 3 Functional positioning and connection models of various practical teaching platforms

7. summary

National construction requires different types of big data professionals. Local agricultural colleges and universities meet the basic requirements in personnel training, strive to accurately locate and develop characteristics, and train big data talents for the agricultural field.

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