

# SWOT Analysis-Based Research on Cultivation of Industry University Cooperation Talents in Data Science and Big Data Technology Course and Its Practice

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**Abstract:** This paper mainly analyzes the advantages, disadvantages, opportunities and challenges of the major of data science and big data technology with the help of SWOT analysis method, and puts forward that the training of data science and big data technology talents with industry university cooperation is the basic starting point, focusing on cultivating students' practical development ability, team cooperation ability and professional quality of learning and innovation. Through the industry university cooperation between enterprises and universities, build a more scientific course system and create richer teaching contents, so that students can solidly master object-oriented program development methods, big data development technologies and tools, and machine learning algorithms, so as to lay a foundation for cultivating students' multi domain big data development ability.

**Keywords:** SWOT analysis; Data Science and big data Technology major; Industry university cooperation; personnel training

## 1. Introduction

Using SWOT analysis method, this paper analyzes the direction and course construction of big data major, combines school-enterprise industry-university cooperation to cultivate talents in data science and big data technology, and conducts course construction through school-enterprise cooperation. The framework of our school's big data-related professional knowledge system is determined, including mathematics, statistics, computer and big data analysis. The core knowledge points and skills required for the six major modules of big data processing (data acquisition and preprocessing, data storage and management, data analysis and modeling, data visualization, big data technology platform, practical ability) are decomposed to form different types of courses, which are marked as theoretical courses and practical courses from another dimension. Using school-enterprise cooperation platform, we strengthen the course practice link and refine the

experimental process. Under the goal of cultivating students' professional skills and driven by the engineering cases formulated for school-enterprise cooperation, we consider the actual needs of enterprises, integrate new technologies in the industry, emphasize the concept of applied undergraduate talent training to achieve industry-university integration, and improve students' application ability, communication ability, teamwork ability and innovative practice ability.

## 2. SWOT Analysis Method

SWOT analysis is a situational analysis based on the internal and external competitive environment and conditions, which is to enumerate main internal strengths, weaknesses and external opportunities and threats closely related to the research object [1] through investigation. It then arranges them in matrix form, makes analysis of various factors based on systematic analysis, and draws a series of corresponding conclusions usually featuring certain decision-making nature [2].

### 2.1 Strength Analysis

- (1) Specifications of professional personnel training programs aiming at employment;
- (2) The clarified course standards, clear course content, and standardized education and teaching;
- (3) Most of the professional foundation courses can be taught in the teaching mode integrating theory and practice;
- (4) Courses can be closely linked to the market and can be adjusted flexibly;
- (5) The course fits the regional economy.

### 2.2 Weakness Analysis

- (1) Insufficient investment in pre-course construction funds, which affects the construction of majors and courses;
- (2) Teaching is based on the Internet, and teachers lack efficiency in making micro-courses and MOOCs;
- (3) There is a lack of laboratory platform software and hardware;
- (4) The newly-set major has no graduates, making it

difficult to analyze data such as employment.

### 2.3 Opportunity Analysis

(1) The Provincial Department of Education, the municipal government and the college place great emphasis on course construction;

(2) The regional economy is in continuous development, with strong demand for talents;

(3) The college's software service outsourcing-based embedded talent training project is steadily advancing;

(4) The characteristic school-enterprise cooperation is continuously advanced.

### 2.4 Threat analysis

(1) The fierce competition among undergraduate colleges in the province;

(2) Difficulty in breaking through traditional innovation and lack of characteristics;

(3) Difficulty in applying for and concluding provincial quality courses;

(4) Insufficient breakthrough in provincial competition.

## 3. Construction Goals

Driven by the construction of college students practice bases in school-enterprise collaborative data science and big data technology major [3], it is necessary to make full use of the opportunity of the Department of Education's professional brand building and the college's "Thirteenth Five-Year" construction plan, gain foothold in industry-university cooperation and collaborative education project, run new technologies and industry standards through the course content, innovatively build a talent training model for data science and big data technology, complete and optimize the school-enterprise collaborative talent training mechanism [4]. Through the in-depth integration of school-enterprise cooperation, it is possible to achieve deep-level cooperative education, cooperative teaching, and cooperative training, increase students' skills reserves, adapt them to industry needs. It is necessary to focus on cultivating students' innovative awareness and entrepreneurial ability, and further improve students' innovative literacy and employment competitiveness, build the major into a provincial-level specialty major with rich teaching resources, capable teaching teams, outstanding teachers' teaching ability, and high teaching quality.

## 4. Construction Content

With the reform in teaching content and course system of data science and big data technology as the core, driven by the collaborative education project of industry-university cooperation, new technology and industry standards are run through the teaching process to innovatively build applied undergraduate course content in data science and big data technology major and other supporting resources. Training of data science and big data technology talent must closely focus on the talent training goals [5], reflect the modern education and teaching philosophy, follow the principle of combining systematicness and advancement, and conform to the

laws of science, advancement and modern education and teaching. With cultivating high-quality, applied data science and big data technology professionals as the goal, students are required to possess practical application ability, communication and organization ability, and comprehensive innovation ability in terms of ability structure, and master humanistic quality knowledge, professional foundation knowledge, innovation and expanding knowledge in terms of knowledge structure [6].

The courses should be customized for students in three directions:

(1) Professional graduate employment positions (groups) and corresponding courses: analyze the tasks corresponding to the positions (groups), summarize the required knowledge and abilities, and develop corresponding courses and contents.

(2) Acquisition of vocational qualification certificates and corresponding courses: analyze vocational ability requirements, find corresponding courses, and develop corresponding course content.

(3) Participation in competition projects and corresponding courses: determine the key assessment points of the competition project, find the corresponding courses, and develop the corresponding course content.

## 5. Implementation Paths

### 5.1 Reform Training Programs and Explore Talent Training Models

Considering the characteristics of our school as a local application-oriented undergraduate university and the advantages of mathematics teaching and research section of the basic teaching college, in construction of big data majors, we obey the idea of "strengthening mathematical foundation, strengthening computing skills, and highlighting professional characteristics" [7], adopt the cooperative enterprise's opinions to reform the teaching plan and syllabus of data science and big data technology major. During the project construction, we plan to construct core course groups such as "Data Acquisition and Web Crawler", "Big Data Mathematical Foundation", "Big Data Statistics Foundation", "Big Data Computer Foundation", and "Big Data Application and Analysis". Focus is given to the construction of several courses valuing cultivation of practical application ability and innovation ability. By learning from the successful experience of other colleges and universities, we implement the guiding ideology of "stratification + diversion, individualized development", change the traditional professional training mode to divert undergraduates under the goal of talent training, implement new training model of "professional courses + school-wide minor courses, innovative laboratory, school-enterprise collaborative training" in order to build a diversified and three-dimensional talent training model for data science and big data technology major in local colleges and universities.



**Figure 1.** Course Reform Roadmap

**5.2 Construction of Professional Teaching Staff**

Considering the strong interdisciplinary and practice-oriented characteristics of big data major, the current teacher structure and talent team construction conditions in local colleges and universities, appropriate teacher team construction measures are formulated:

(1) Break down the barriers of the college, deeply integrate the teaching staff of mathematics, statistics, computer science and other related applied disciplines, so that "big data mathematics foundation", "big data

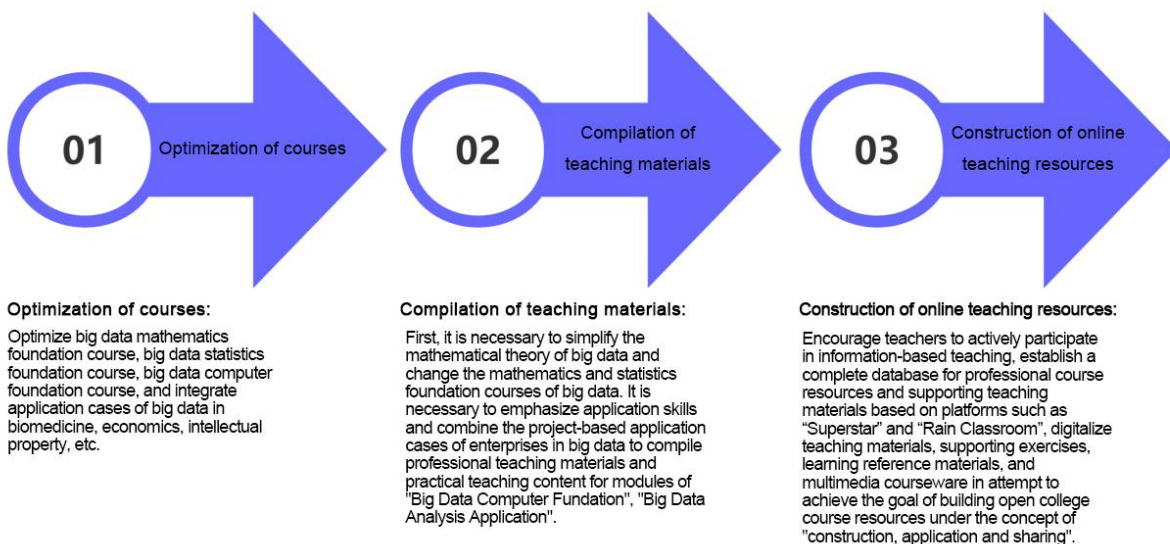
statistics foundation", "big data computer foundation", "big data application and analysis" are organically combined;

(2) Select teachers to participate in the training of big data engineer education teachers and course communication in a planned way;

(3) By carrying out "school-enterprise cooperation", in-service teachers are encouraged to take full-time positions in big data-related enterprises, and promising young teachers are encouraged to jointly apply for national, provincial and municipal scientific research projects with enterprises or directly participate in enterprise practice, and experts, scholars and scientific and technological personnel of relevant enterprises can be hired to take part-time jobs, give lectures, and guide graduation design, etc. in schools, so that the teaching and research of teachers of this major is always at the international forefront, facing the main battlefield of economic and social development and the new needs of the public.

**5.3 Construction of Teaching Resources**

With cultivation of mathematical literacy, statistical literacy, big data processing and application ability as the core, the course system, teaching content and practical teaching are reformed and optimized, so that both theoretical teaching and practical teaching are equally important. The specific measures are as follows:



**Figure 2.** Course Optimization Reform Roadmap

(1) Optimize the big data mathematics foundation course, big data statistics foundation course, and big data computer foundation course, and integrate the application cases of big data in biomedicine, economics and intellectual property;

(2) In terms of compiling teaching materials, first, it is necessary to simplify the mathematics theory of big data and adapt the mathematics and statistics foundation

courses of big data. Second, it is necessary to stress application skills, compile professional textbooks and practical teaching contents of "big data computer foundation" and "big data application and analysis" modules based on the project application cases of enterprises in big data;

(3) In construction of online teaching resources, at present, our school encourages teachers to actively

participate in information-based teaching, establishes a complete database of professional course resources and supporting teaching materials in conjunction with platforms such as "Superstar" and "Rain Classroom", and digitalizes textbooks, supporting exercises, learning reference materials, multimedia courseware, etc., in attempt to achieve the goal of building open college course resources under the concept of "construction, application, and sharing".

## 6. Construction Achievements and Prospects

We have set up multiple courses such as "Data Preprocessing", "Data Acquisition and Web Crawler", "Big Data Visualization Technology", "Stream Data Processing Technology", "Big Data Development Technology", "Course Design for Big Data Application Development Technology" and built a corresponding course resource database [8]. Since 2019, 3 batches of big data-related talents have been cultivated. At the same time, the 19th batch of students will graduate this year, and some of them have been pre-hired during the internship period by many internship companies engaged in school-enterprise cooperation.

Statistical data acquired through inquiry-based research during the teaching period shows that most students like and are satisfied with the teaching method of school-enterprise-industry cooperation. Where, the theory-project-based teaching in school-enterprise-industry cooperation is the most satisfactory, which obviously attracts students' interest and enthusiasm for learning compared to theory-experiment-based teaching. In the satisfaction teaching evaluation stage at the end of the term, the applause rate of big data courses is over 90% in teaching evaluation.

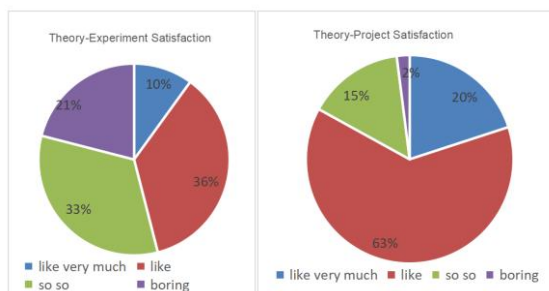


Figure 3. Statistical Chart of Course Satisfaction Evaluation

It is expected that data science and big data technology major based on school-enterprise industry-university cooperation will embody distinctive characteristics in talent training mode, teaching content, teaching methods, teaching staff, teaching resources, etc., continuously improve talent training quality, and continuously enhance the ability to serve the local economy in Nantong. It has played a good leading, driving and exemplary role in the education of similar local undergraduate colleges and universities. A long-term talent training mechanism is established to form a scientific, complete and long-term effective professional training program and course system in data science and big data technology.

## 7. Conclusion

With the help of SWOT analysis method, data science and big data technology major based on school-enterprise-industry-university cooperation has been comprehensively analyzed in terms of talent training mode, teaching content, teaching methods, teaching staff, teaching resources, etc. Experiences are summed up in teaching. Teaching methods and personnel training methods have distinctive characteristics. Students have good feedback on the teaching process and are highly motivated. Professional teachers also gain experiences in the enterprise and society through the teaching process, so they have a clear direction for practical development and application. Demand is reasonable and is no longer pure fictional production demand in teaching. In the school-enterprise cooperation, it is necessary to select appropriate cooperative enterprise, select appropriate project as a teaching case for hands-on training, so that students are competitive before entering the society. It is necessary to continuously improve the personnel training quality, and continuously enhance the ability to serve the local economy of Nantong. At the same time, there is need to reach a long-term cooperation consensus with enterprises, establish a long-term mechanism for talent training, and jointly build courses and training systems to truly meet the needs of enterprises and students.

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