

# ***Big Data General Education Courses in Local Application-oriented Universities: Research and Practice in Weifang University***

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**Abstract:** With the rapid development of technology and society, big data technology has become increasingly crucial for technological innovation and social progress. The implementation of big data general education courses aims to equip students with essential knowledge and skills needed in the big data era. However, we are facing significant challenges to implement such courses in local application-oriented universities like Weifang University. First, the threshold for data-thinking cultivation is somewhat high. Second, it is difficult to combine big data general education and specialty applications. Third, the existing courses lack ideological and political elements. In view of these challenges, we propose our solutions. First, concretization of data thinking: we impart data-thinking with concrete examples. Second, industry-academia cooperation: we make the knowledge application-oriented by leveraging real cases from enterprises. Third, full coverage of ideological and political elements: we integrate ideological and political elements into every chapter of the courses. Teaching practice validates our solutions.

## **1. Introduction**

### **1.1. Background and Related Works**

With the rapid development of society and the continuous progress of technology, application talents with deep knowledge of big data technology are playing an increasingly important role in technological innovation and social progress. The big data general education course can guide students to master the general knowledge and skills required in the bigdata era, cultivate basic way of thinking for students to use big data and related technologies to analyze and solve problems, and enhance communication skills in the digital context. It is of great significance for cultivating

application talents [1].

The teaching of big data general education courses for the training of application talents has been widely concerned in both domestic and international academic circles. As an important base for talent training, colleges and universities should actively explore and practice the new model of big data general education in order to cultivate application talents with innovative spirit and practical ability.

Scholars such as Professor Zhan Deshen of Harbin Institute of Technology believe that helping the transformation and upgrading of traditional majors is one of the important tasks in the reform of emerging application-oriented professional education, among which improving the ability of application-oriented talents in information disciplines is at the core. They pointed out that computational thinking is the third kind of subject thinking, which attaches equal importance to theoretical thinking and experimental thinking. Integrating computational thinking is an important development trend of application majors in the future, and strengthening the training of computational thinking ability has become a key step to train new engineering talents [1]. The transformation and upgrading of traditional majors is one of the important tasks of the new engineering education reform, and emphasizes the core of integrating and improving the information subject ability of new engineering talents. Among them, data thinking, as the fourth type of discipline thinking that attaches equal importance to theoretical thinking, experimental thinking and computational thinking, is considered to be the most cutting-edge thinking mode of information discipline. Therefore, strengthening the training of data thinking ability becomes the key to train new engineering talents. Scholars such as He Hong of Shandong University believe that with the popularity of cloud computing resources and the increasing demand for computing power from the development of artificial intelligence, the computing mode is gradually developing from serial to parallel. However, the number of computer science graduates who can write parallel programs is very limited, which means that the curriculum system of computer science undergraduate training has lagged behind the needs of economic development. Therefore, they proposed to add elective courses of high performance computing and general education courses of high performance computing in the computer undergraduate training program. Through practice, it has been proved that students who choose HPC courses have the ability to solve large-scale complex computing problems and have a wider range of employment options, which can meet the needs of national economic development for HPC talents [2]. Sun Yongxiang and other scholars from Shandong Agricultural University are committed to cultivating students' ability related to data thinking, providing a basis for students of all majors to apply big data and computer technology to solve complex engineering problems. They believe that the big data General education Courses with distinct characteristics of big data technology play an important role in interdisciplinary integration innovation and new agricultural science construction. Based on the analysis of the significance and current situation of big data general education in colleges and universities and the combination of school characteristics and talent training goals, his research work explores the teaching reform of big data general education courses in the context of interdisciplinary integration [3]. Ren Jingjing and other scholars from the University of Information Engineering introduced the problems existing in the course "Fundamentals of Programming" and the blended teaching mode proposed to solve these problems. Based on the OBE concept and PBL method, the teaching model integrates the three platforms of rain class, MOOCs and EduCoder, and builds three case bases of knowledge point cases, knowledge point application cases and comprehensive application cases. This teaching mode aims to improve students' autonomous learning ability, problem solving ability and process evaluation level [4].

Scholars from other universities in China have also made a series of explorations around the teaching of big data general education courses, among which the representative research work

includes: the integration strategy of computer and big data general education courses with specialized courses [5], and the reform of teaching mode of big data-related general education courses [6].

International academic circles also emphasize the importance of big data general education courses, among which the representative views come from the scholars of the New York State Institute of Technology. They believe that students, regardless of their academic major, will benefit from big Data and related courses. While there are clear advantages to studying computer science for students in quantitative and analytical fields (science, technology, engineering, and mathematics, i.e., STEM disciplines), for students in non-STEM fields, taking general education courses related to big data can help promote interdisciplinary collaboration, collaborative learning, and improve job prospects after graduation [7-8].

## 1.2. Main Contributions

Generally speaking, domestic colleges and universities actively explore and practice project-based teaching methods, case teaching methods and other teaching methods in the teaching of big data-related general education courses, and pay attention to the subject status and participation of students. By guiding students to participate in the analysis and solution of practical projects or cases, students' practical ability and innovative thinking are cultivated. In foreign countries, the practice of general education related to big data has also attracted much attention. Many colleges and universities set up general education courses of data thinking, and pay attention to training students' practical ability and innovative thinking. At the same time, foreign researchers are also actively exploring new teaching methods and means to improve the teaching effect.

The teaching practice of big data general education courses for local application-oriented talents training still faces some challenges. These challenges include but not limited to: mismatch between the existing training methods/curriculum and the demand of local application-oriented universities, and lack of ideological and political education. In our work, we conduct research in Weifang University to pursue solutions to these challenges:

First, we explore the local-application-university-oriented solution of data thinking cultivation.

Second, we investigate on reshaping the courses in accordance with the requirements of local employment market.

Third, we propose our solution to integrate ideological and political elements into the courses.

The rest of this paper is organized as follows. Section 2 points out the challenges to the construction and teaching of big data general education courses. We propose our solutions to the challenges in Section 3. Section 4 concludes our work.

## 2. Current Challenges

At present, there are still some barriers to the development of big-data general education courses under the background of local application-oriented universities.

### 2.1. High Threshold for Data-Thinking Cultivation

First of all, the training methods of data thinking are mostly derived from research universities, and lack of consideration for the source of students in local application universities.

Against the backdrop of the increasing popularity of big data and artificial intelligence technologies, data thinking has become an essential quality for applied talents. This project will conduct research on students from local applied universities to understand their characteristics and needs, in order to efficiently cultivate students' data thinking through big data general education

courses.

The main difficulty in this research focus lies in what carrier to use to concretize the abstract literacy of data thinking and then impart it to students.

## 2.2. Difficulty in Combining Big Data General Education and Specialty Applications

Secondly, it is also a problem that the curriculum is not closely combined with the major. Most of the existing big data general education courses focus on theoretical teaching and lack the combination with practical application.

The ultimate goal of the big data general education course is to combine data thinking with specific problems in a particular field, in order to lay a computational foundation for graduates to solve practical problems in their field in the future. Therefore, it is necessary to integrate the specific applications of each profession in a clear and concise manner.

The main difficulty in addressing this research focus is that the audience for big data general education courses is usually lower grade students, including even some humanities majors; At this stage, students generally lack intuitive understanding of the application of big data technology. How to resolve this contradiction requires in-depth research.

## 2.3. Lacks of Ideological and Political Elements

Finally, the current big data general education courses lack attention to ideological and political elements, including craftsman spirit, exploration spirit and so on.

As an important component of university education, general education courses should focus on students' ideological and political education. This project will investigate how to organically integrate ideological and political elements into big data general education courses, cultivate students' sense of social responsibility and creativity, and enable them to become high-level applied talents with ideals, culture, and ethics.

The main difficulty in this research focus lies in how to combine students' knowledge background and cognitive habits to develop ideological and political teaching content for the curriculum.

## 3. Solutions

### 3.1. Overall Roadmap

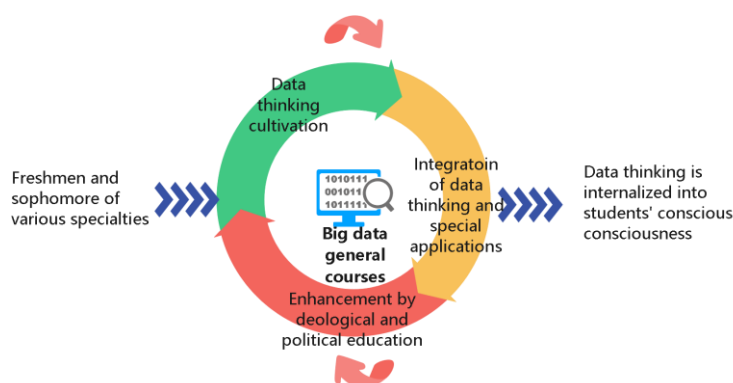


Figure 1: Overall roadmap of our work

As shown in Figure 1, our work is guided by the cultivation of applied talents' general knowledge of big data, guided by the cultivation of data thinking, with the long-term goal of

computer applications in specific professional backgrounds, and strengthening students' comprehensive literacy through curriculum ideological and political education.

## **3.2. Implementation Steps**

### **3.2.1. Concretization of Data-thinking**

We extract several typical types of data thinking based on industry demand and integrate them into specific course knowledge and skill points.

Conduct research on the information technology literacy needs of applied local universities in the context of new engineering disciplines, study the development plans of Shandong Province and Weifang Municipal Government for applied characteristic universities, investigate and predict the demand for local information technology talents, based on the actual situation of the school, and reform the information technology talent training system of local universities.

Establish competency oriented educational goals and clarify that the goal of big data general education is to cultivate students' data thinking, programming, data analysis, and problem-solving abilities, rather than just imparting theoretical knowledge.

Strengthen the experimental teaching process and improve students' practical operation ability. By practical operation, students are encouraged to understand and master computer knowledge in a more intuitive way.

Adopting various teaching methods, such as case-based teaching, project-based teaching, flipped classroom, etc., to improve teaching effectiveness. The above methods can enhance students' subject status, improve their learning interest and participation.

### **3.2.2. Integration of Enterprise Resources into Course Teaching**

We give full excavation of enterprise resources, set specific application backgrounds for each chapter of big data general education courses based on actual cases, so that teaching can be targeted.

Strengthen cooperation with enterprises, jointly formulate talent training plans, develop courses and textbooks, etc. Through school enterprise cooperation, we can better understand industry needs and technological developments, and cultivate applied talents that meet market demands.

Adjusting and optimizing the course content of big data general education, in addition to traditional computer basic knowledge courses, should also add courses closely related to practical applications, focusing on real-time updates of course content to adapt to the rapidly developing big data technology. Knowledge such as data science, artificial intelligence, cloud computing, network security, etc. should be included in the course content system.

### **3.3.3. Full Coverage of Ideological and Political Elements**

In accordance with national policy requirements and course characteristics, we integrate ideological and political elements into every chapter of the big data general education course

Taking ideological and political education in the curriculum as the starting point, we aim to promote the formation of a comprehensive education pattern throughout the curriculum, reflecting the comprehensive educational concept of "cultivating virtue and nurturing people", and integrating ideological and political education in the curriculum with big data general education in a scientific manner. To achieve this goal, targeted efforts should be made to strengthen the construction of the teaching team, improve the professional level and teaching ability of teachers. By organizing teacher training, academic exchanges, and other activities, we aim to enhance the affinity and infectiousness of teachers' teaching. In addition, hiring industry experts as part-time teachers or mentors, introducing cutting-edge trends and technological experience in the industry, and keeping

ideological and political elements up-to-date.

On this basis, guided by the construction of Weifang University as an applied characteristic prestigious school, the construction of national first-class majors, and the requirements for professional certification, we aim to create a big data general education course system that integrates and innovates majors, with reasonable compulsory and elective settings, scientific construction of characteristic modules, complementary online and offline teaching resources, complete teaching content and curriculum system, and diverse teaching methods and means.

## 4. Conclusions

In this paper, we demonstrate our research and practice in big data general education courses. We summarize the effectiveness of our work as follows.

### 4.1. Interdisciplinary Integration

Big data general education should not be limited to the teaching of big data technology, but integrate it with other disciplines such as mathematics, physics, engineering. Through interdisciplinary teaching content and methods, our work can cultivate application -oriented talents with comprehensive quality and cross -disciplinary thinking, and better meet the needs of society.

### 4.2. University-enterprise Cooperation

We extend the advantages of school -enterprise cooperation from professional courses to general education courses to jointly revise the curriculum outline. Through school -enterprise cooperation, you can better understand industry needs and technological development, and cultivate applied talents that meet market demand. At the same time, enterprises can also participate in the process of talent training through cooperation, so that students can exercise and improve their skills in a real environment, and provide more opportunities for students' practical practice and future practice and employment.

### 4.3. Curriculum Ideological and Political Coverage

Big Data General Lessons not only teach technical knowledge, but also pay attention to students' thinking methods and moral literacy. We guide students to think about the social impact of technological development and pay attention to technical ethics and morality. Through discussion and case analysis in the course, students' sense of social responsibility and values can be cultivated and their comprehensive quality is improved.

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