

THE TRAINING MODE OF APPLIED TALENTS IN THE MAJOR OF BIG DATA MANAGEMENT AND APPLICATION UNDER THE GUIDANCE OF CURRICULUM IDEOLOGICAL AND POLITICAL EDUCATION

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Abstract: Against the backdrop of the in-depth integration of emerging engineering education and curriculum ideological and political education, the major of Big Data Management and Application, a typical interdisciplinary emerging engineering major, needs to break through the limitation of "emphasizing technology over values" in cultivating applied talents. Taking the Introduction to Big Data course as the core starting point, based on the implemented ideological and political construction practice and the systematic content of the teaching syllabus of this course, this paper constructs a four-in-one talent training mode of in-depth integration of "Curriculum Ideological and Political Education + Professional Education" covering "goals-content-practice-evaluation". By exploring ideological and political elements suitable for the professional characteristics, designing case-driven and project-oriented teaching practice paths, and establishing a multi-dimensional quantitative evaluation system, the organic unity of knowledge imparting, ability training and value shaping is realized. This research provides a replicable and promotable practical plan for the cultivation of big data-related professional talents in private application-oriented undergraduate universities.

Keywords: Curriculum ideological and political education; Emerging engineering education; Big data management and application; Applied talents; Training mode

1 INTRODUCTION

With the vigorous development of the digital economy, big data technology has become a national strategic emerging technology, and the contradiction between supply and demand for talents in the major of Big Data Management and Application has become increasingly prominent. At present, the market not only requires talents to have solid professional skills such as data analysis and algorithm application, but also emphasizes their comprehensive qualities including data ethics, national security awareness, and patriotism. The Guidelines for the Construction of Curriculum Ideological and Political Education in Colleges and Universities clearly states that ideological and political education should be integrated into the entire teaching process of all disciplines and majors in colleges and universities, so as to realize the synergistic development of various courses and ideological and political courses.

As an emerging engineering major integrating computer science, mathematics, management and other disciplines, Big Data Management and Application features a curriculum system with both theoretical abstraction and practical application, providing a rich carrier for the integration of curriculum ideological and political education[1-2]. As the core introductory course of this major, Introduction to Big Data undertakes the dual mission of professional cognition and value enlightenment[3]. Its teaching syllabus clearly covers a complete knowledge system including an overview of big data, technical principles, application practice, and ethical security, laying a solid foundation for the systematic exploration of ideological and political elements and the construction of an ideological and political education system. However, there are still some problems in the current talent training of this major, such as the disconnection between ideological and political elements and professional teaching, the lack of a systematic education system, and the insufficient exertion of the leading role of the introductory course. Based on this, taking the Introduction to Big Data course as the core starting point and relying on the systematic content of its teaching syllabus and the implemented ideological and political construction practice, this paper explores a systematic curriculum ideological and political education mode covering the entire professional curriculum system, providing theoretical and practical support for cultivating applied big data talents with "solid technical skills, comprehensive qualities and a strong sense of responsibility".

2 RESEARCH STATUS

Domestic academic circles have achieved fruitful results in the integration of emerging engineering education and curriculum ideological and political education and the cultivation of big data-related professional talents, focusing on three core directions: First, clarifying the dialectical unity of emerging engineering education and curriculum ideological and political education and constructing a diversified education framework. For example, Xiao Ning et al. (2026) proposed a "one line, three cores and six types" system for the Data Mining course, integrating three cores and

six types of ideological and political elements with the OBE concept as the main line[4]; Zhang Jiajing et al. (2026) built a four-in-one framework of "teaching objectives-exploration of ideological and political elements-collaborative teaching practice-effect evaluation system" for the Machine Learning course[5]; Luo Guanghong et al. (2025) explored the integration path of ideological and political education from four dimensions of objectives, content, methods and evaluation in the course Data Warehouse Technology[6]. Second, the continuous innovation of practice paths has formed mainstream methods such as case-driven, project-oriented and blended teaching, realizing the "genetic integration" by accurately matching cases such as domestic AI technology and the national big data strategy with professional knowledge points[7]. Third, the evaluation mechanism has been gradually improved, and a multi-dimensional and quantifiable assessment system has been constructed, taking into account the evaluation of knowledge, ability and literacy[8].

There is no clear concept of "curriculum ideological and political education" abroad, but relevant research is highly consistent with China's core concepts: First, attaching importance to engineering ethics education, incorporating data privacy protection and algorithm fairness into the training objectives of big data-related majors, offering compulsory courses such as Data Ethics, and guiding students to think about the social impact of technology through real cases; Second, talent training is oriented to industrial needs, focusing on practical ability and interdisciplinary integration, and implementing in-depth school-enterprise cooperation to enable students to improve their technical application ability in real projects[9]; Third, using technology to empower educational evaluation, tracking changes in students' value cognition through learning analysis technology to achieve accurate monitoring of talent training effects[10]. The limitations of foreign research are as follows: ethics and value education are based on Western cultural backgrounds, lacking the connotation of Chinese characteristics such as patriotism and rejuvenating the country through science and technology; there are few studies on the talent training mode of big data majors at the application-oriented undergraduate level, which has poor adaptability to the school-running orientation of China's private universities; the ideological and political enlightenment role of professional introductory courses is ignored, which is inconsistent with the training logic of "from introduction to deepening" in China's colleges and universities.

Domestic and foreign research provides theoretical and practical references for the cultivation of big data professional talents under the guidance of curriculum ideological and political education, but the core gaps are concentrated in: the lack of a systematic ideological and political education mode for the whole major taking the Introduction to Big Data course as the starting point; the lack of adaptive design for private application-oriented undergraduate universities; and the failure to construct a closed-loop system of ideological and political elements with vertical progression and horizontal connection. Based on the above gaps, relying on the teaching syllabus and ideological and political practice of the Introduction to Big Data course, this paper constructs a talent training mode adapted to private application-oriented undergraduate universities, clarifies the enlightenment and leading role of the introductory course, and realizes the in-depth integration of ideological and political education and professional education.

3 CONSTRUCTION OF THE TRAINING MODE OF APPLIED TALENTS IN BIG DATA MANAGEMENT AND APPLICATION UNDER THE GUIDANCE OF CURRICULUM IDEOLOGICAL AND POLITICAL EDUCATION

3.1 Training Objectives: A Three-in-One Education Objective System

Based on the requirements of emerging engineering education, the connotation of curriculum ideological and political education, as well as the teaching syllabus and ideological and political construction practice of the Introduction to Big Data course, a three-in-one applied talent training objective system of "knowledge-ability-value" is constructed, clarifying the specific requirements and implementation paths of each dimension. Among them, the value dimension closely relies on the core ideological and political elements such as patriotism, national security awareness, craftsman spirit and data ethics explored in the Introduction to Big Data course, realizing the progressive training from introductory enlightenment to professional deepening.

1. Knowledge dimension: Master the core professional knowledge of big data, including basic theories and professional skills such as data collection and preprocessing, big data storage and management, data analysis and visualization, and basic algorithms; understand relevant policies and industry norms such as the national big data strategy, data security laws and regulations, and the development status of the big data industry; form basic data awareness and data thinking to lay a foundation for subsequent professional learning.

2. Ability dimension: Possess abilities such as practical operation of big data tools, analysis and solution of complex problems, interdisciplinary collaboration, and innovative practice; be able to use big data technology to solve practical problems in fields such as enterprise operation, social governance and people's livelihood services; have the ability of independent thinking and critical thinking, and be able to conduct rational analysis and judgment on the application of data technology.

3. Value dimension: Establish the patriotism of serving the country through science and technology and the firm belief in rejuvenating the country through science and technology, and enhance national self-confidence and independent innovation awareness; consolidate national security awareness and the overall national security concept, and develop good habits of personal information protection and data security protection; uphold the rigorous craftsman spirit and realistic and pragmatic scientific attitude, and cultivate the spirit of collaboration and social responsibility; establish a correct view of data ethics and professional literacy, and adhere to the moral bottom line and value criteria for data use.

3.2 Curriculum System: An Ideological and Political Integrated Curriculum System of "Introduction Leadership + Core Support + Practical Expansion"

Taking the Introduction to Big Data course as the starting point, relying on its systematic knowledge system in the teaching syllabus and the formed corresponding system of "chapter content-ideological and political elements of knowledge points-integration approaches", a curriculum ideological and political education system with "vertical progression and horizontal connection" is constructed. Core ideological and political elements such as patriotism, national security awareness, craftsman spirit and data ethics are systematically integrated into the entire course teaching process, realizing the enlightenment and leading of ideological and political elements in the introductory course, the deepening and expansion in core courses, and the practice and implementation in practical courses.

3.2.1 Introduction to big data: playing the core role of ideological and political enlightenment and leadership

As the core introductory course of the major of Big Data Management and Application, it undertakes the dual mission of "professional cognition + value shaping", and its ideological and political construction is the foundation of the professional education system. Relying on the 9 knowledge units of the course teaching syllabus, the ideological and political elements contained in each knowledge point are deeply explored to form a four-dimensional accurate matching system of "core knowledge points-ideological and political elements-integration approaches-teaching resources". Through the core methods of case teaching + discussion teaching + practical operation, the in-depth integration of ideological and political elements and professional introductory knowledge is realized, laying a value foundation for the integration of ideological and political education in subsequent courses. The core ideological and political integration practices are shown in the following table:

Table 1 Integration of Core Knowledge Points and Ideological and Political Elements in Big Data Courses

Core Knowledge Points	Ideological and Political Elements	Integration Approaches	Teaching Resource Support
Concept, characteristics and development history of big data	Patriotism, rejuvenating the country through science and technology, national self-confidence	Case teaching + group discussion	1. Cases of the development of China's big data industry; 2. CCTV9 documentary The Age of Big Data
Collaboration of cloud computing, Internet of Things and blockchain technologies	Spirit of independent innovation, craftsman spirit, awareness of collaboration	Case analysis + technology disassembly	1. Cases of domestic cloud computing platforms such as Alibaba Cloud and Huawei Cloud; 2. Case of JD's intelligent warehousing (IoT + cloud computing + big data)
Big data security, big data ethics, sharing and opening.	National security awareness, concept of rule of law, data ethics, social responsibility	Case discussion + debate	1. 2024 user data leakage incidents; 2. Investigation videos on "big data price discrimination"
Big data practice in various industries (Internet, logistics, government affairs, etc.)	Social responsibility, sense of mission, service awareness	Case teaching + practical research	1. Case of Cainiao Network's intelligent warehousing allocation; 2. Case of targeted poverty alleviation with government big data; 3. Case of big data application in epidemic prevention and control
Specifications for data collection, data cleaning, data desensitization	Concept of rule of law, rigor and carefulness, professional literacy	Hands-on practice + case warning	1. Cases of legal data collection with Python crawlers; 2. Cases of privacy leakage caused by failed data
Distributed storage, domestic databases, cloud databases	Independent innovation, craftsman spirit, serving the country through science and technology	Comparative analysis + technical research	1. Cases of localized application of the Hadoop ecosystem; 2. Cases of domestic substitution of NoSQL databases such as MongoDB
Data analysis process, basics of machine learning, analysis tools	Scientific thinking, innovation awareness, striving for perfection	Case demonstration + tool operation	1. Case of K-Means clustering application in population analysis; 2. Operation tutorials of visualization tools such as Tableau/Power BI; 3. Real cases of enterprise sales data analysis
Visualization principles, chart design, information communication	Sense of responsibility, rigor, service thinking	Case display + practical design	1. Excellent cases of epidemic data visualization; 2. Case of campus consumption heat map design

3.2.2 Core course group: strengthening the deepening and expansion of ideological and political elements

Based on the ideological and political elements of the Introduction to Big Data course, a professional core course group is constructed to realize the vertical progression and horizontal connection of ideological and political elements. Vertically, the basic ideological and political elements of the introductory course are further deepened in the core courses; horizontally, different core courses expand the same ideological and political element from multiple perspectives combined with their own knowledge points, forming a joint force for ideological and political education[11-12]. The integration of ideological and political education in the core course group is based on the teaching methods of the Introduction to Big Data course, and the teaching mode is optimized according to the characteristics of the courses. The core integration practices are as follows:

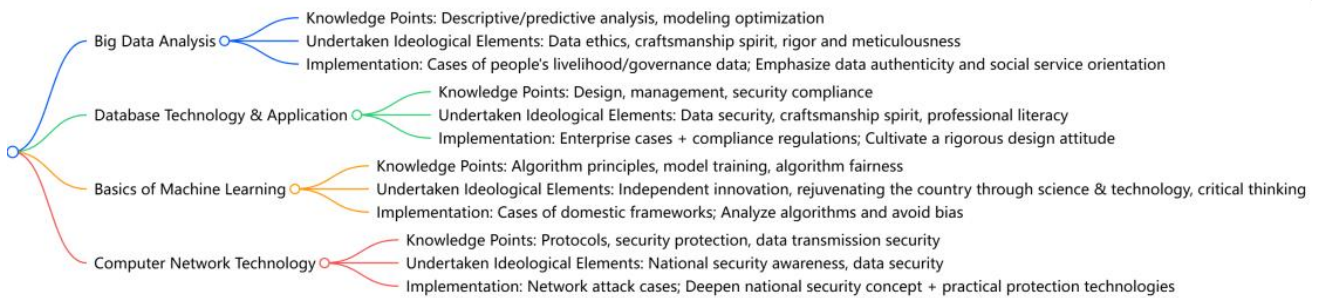


Figure 1 The Core Integration Practices

3.2.3 Practical expansion courses: realizing the practice and implementation of ideological and political elements

A four-level practical system of "basic experiment-comprehensive training-enterprise practice-competition and innovation" is constructed. Taking the ideological and political elements of the Introduction to Big Data course as the core, they are integrated into all links of practical teaching to realize the transformation from "theoretical cognition" to "practical practice", enabling students to deepen their value cognition in hands-on practice and achieve the unity of knowledge and action.

1. Basic experiments: Relying on the knowledge points and ideological and political elements such as data collection, data preprocessing and data security in the Introduction to Big Data course, carry out basic experiments such as data cleaning, data storage and simple data analysis to cultivate students' rigorous and meticulous scientific attitude and data security protection awareness.

2. Comprehensive training: Design interdisciplinary training projects around the national big data strategy and social governance needs, such as "government big data analysis", "data mining of agricultural product sales for rural revitalization" and "data security protection of urban communities", undertaking the ideological and political elements such as patriotism, social responsibility and serving the country through science and technology from the introductory course, and enabling students to experience the social value of big data technology in project practice.

3. Enterprise practice: Cooperate with local big data enterprises and science and technology enterprises to arrange students to participate in the development of real projects such as enterprise data management, user data protection and big data platform operation, undertaking the ideological and political elements such as professional literacy, data ethics and craftsman spirit from the introductory course, and enabling students to strengthen professional ethics and a sense of responsibility in enterprise practice.

4. Competition and innovation: Encourage students to participate in competitions such as the "Challenge Cup", "Blue Bridge Cup" and "Big Data Analysis Competition", design works around themes such as data security, people's livelihood services and industrial upgrading, undertake the ideological and political elements such as the spirit of independent innovation, sense of mission and rejuvenating the country through science and technology from the introductory course, and cultivate students' innovative ability and awareness of serving the society.

3.3 Teaching Mode: An Ideological and Political Teaching Mode of "Case-Driven + Discussion-Guided + Blended Teaching + Practice-Empowered"

Taking the diversified teaching methods specified in the teaching syllabus of the Introduction to Big Data course as the core, combined with the characteristics of professional courses and students' cognitive laws, a diversified ideological and political teaching mode of "case-driven + discussion-guided + blended teaching + practice-empowered" is constructed to achieve the educational effect of ideological and political education "infiltrating silently like a gentle breeze and moistening rain", ensure the in-depth integration of ideological and political elements and professional teaching, and avoid "conducting ideological and political education for the sake of it".

1. Case-driven teaching: Laying the foundation for the integration of ideological and political education. Continuing the core case teaching method of the Introduction to Big Data course, a professional ideological and political case database is established. The selection of cases follows the principles of "fitting the syllabus, close to national conditions and keeping pace with the times", divided into positive demonstration cases and negative warning cases. Positive cases select the achievements of China's big data industry development, national strategy implementation and technological independent innovation, such as domestic big data platforms, government big data applications and big data practice in rural revitalization, to cultivate students' patriotism and scientific and technological self-confidence. Negative cases select data leakage, algorithm discrimination, illegal collection, etc., to strengthen students' data security awareness and data ethics. The case database takes the basic cases of the teaching syllabus of the Introduction to Big Data course as the core, and the core courses and practical courses expand and supplement according to their own characteristics, realizing the systematic and progressive construction of the case database.

2. Discussion-guided teaching: Deepening students' value cognition. Relying on the discussion teaching method of the Introduction to Big Data course, aiming at the ideological and political elements and knowledge points of different courses, design enlightening and speculative discussion questions to guide students to think actively and speak up, realizing the transformation from "passive acceptance" to "active cognition". For example, in the Introduction to Big

Data course, discussions are held on "the role of big data technology in promoting China's digital economy"; in the Basics of Machine Learning course, discussions are held on "the ethical boundary of algorithm application"; in practical courses, discussions are held on "how big data technology can better serve the society". Through progressive discussions, students' understanding and recognition of ideological and political elements are deepened.

3. Blended teaching: Expanding the coverage of ideological and political education Relying on the online learning resources and offline teaching links specified in the teaching syllabus of the Introduction to Big Data course, an online and offline blended teaching mode is constructed, extending ideological and political teaching to the online and realizing the all-time and full-coverage of ideological and political education. Online: Release ideological and political case videos, professional knowledge point explanations, industry cutting-edge trends, policy interpretations and other resources of the Introduction to Big Data course, as well as ideological and political expansion materials of core courses, such as the interpretation of China's big data strategy, the explanation of data security laws and regulations, and interviews with scientists in the big data field for students' independent learning. Offline: Deepen students' understanding of knowledge and ideological and political connotation through classroom discussions, case analysis, project defense, experimental operation and other forms, realizing the seamless connection of online and offline ideological and political education, and integrating ideological and political elements into the entire process of students' professional learning.

4. Practice-empowered teaching: Strengthening the effect of value practice Based on the practical teaching requirements of the teaching syllabus of the Introduction to Big Data course, through diversified practical links such as basic experiments, comprehensive training, enterprise practice and competition and innovation, students are enabled to practice ideological and political elements in hands-on operation. For example, strengthening the rigorous craftsman spirit in data preprocessing experiments; cultivating team cooperation and social responsibility in comprehensive training projects; practicing professional literacy and data ethics in enterprise practice; stimulating the feelings of independent innovation and serving the country through science and technology in competition and innovation, so as to achieve the educational goal of "the unity of knowledge and action".

3.4 Evaluation Mechanism: A Multi-Dimensional Comprehensive Evaluation System of "Knowledge-Ability-Value"

Breaking through the traditional single knowledge assessment mode, based on the assessment requirements and ideological and political education objectives of the teaching syllabus of the Introduction to Big Data course, a concise, clear and operable multi-dimensional comprehensive evaluation system of "knowledge-ability-value" is constructed to comprehensively measure students' professional quality and ideological and political level.

Table 2 The Multi-Dimensional Comprehensive Evaluation System

Evaluation Dimension	Core Evaluation Indicators	Corresponding Ideological and Political Elements	Weight Ratio	Main Evaluation Methods
Knowledge	Mastery of professional basic theories, core skills, policies and norms	Concept of strengthening the country through science and technology, cognition of the national big data strategy	40%	Final exam, classroom quiz, experiment report
Ability	Practical tool operation ability, problem-solving ability, team cooperation ability, innovative thinking ability	Craftsman spirit, team cooperation spirit, innovation awareness	30%	Experimental operation assessment, project achievement acceptance, group cooperation performance
Value	Patriotism, data security awareness, data ethics literacy, social responsibility and professional commitment	Patriotism, overall national security concept, professional literacy, social responsibility	30%	Classroom discussion, case analysis, practical performance, enterprise practice appraisal

The evaluation is implemented with the core of "process evaluation (60%) + result evaluation (40%)". Process evaluation focuses on the literacy performance in the entire learning process, covering the participation in classroom discussions, the quality of experiment reports, group cooperation performance, ideological and political case analysis reports, etc.; result evaluation focuses on knowledge application and project achievements, including final exams, project achievement defense, competition awards, etc., taking into account both quantitative data and qualitative feedback to ensure a comprehensive and objective evaluation.

4 CONCLUSION

The training mode of applied talents in the major of Big Data Management and Application under the guidance of curriculum ideological and political education constructs a three-in-one training objective of "knowledge-ability-value", creates a curriculum system of "introduction leadership + core support + practical expansion", and establishes a concise and operable multi-dimensional comprehensive evaluation system, realizing the in-depth integration of ideological and political education and professional education. This mode gives full play to the ideological and political enlightenment and leading role of the Introduction to Big Data course, realizes the vertical progression and horizontal connection of

ideological and political elements in the entire professional curriculum system, adapts to the school-running orientation and student characteristics of private application-oriented undergraduate universities, and provides a replicable and promotable practical plan for cultivating applied big data talents with "solid technical skills, comprehensive qualities and a strong sense of responsibility".

COMPETING INTERESTS

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