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# Innovative Approaches to Online Ideological and Political Education in Vocational Undergraduate Institutions in the Age of Big Data

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**Abstract:** In the era of big data, virtually all industries are undergoing continuous and profound transformation, driven by advanced analytics and digital integration. Consequently, higher education institutions' online ideological and political education must keep pace with these contemporary technological trends. It is imperative to actively pursue innovative breakthroughs and transition from traditional, extensive teaching models to highly refined, data-driven educational approaches. This paper takes the innovation of online ideological and political education at vocational undergraduate institutions as its primary starting point. It thoroughly analyzes the current challenges inherent in modern educational practice, such as declining student engagement, outdated pedagogical methodologies, and the insufficient utilization of digital footprints. Furthermore, the study examines the unique advantages of big data in this specific context, highlighting its capacity for predictive analytics, real-time feedback, and personalized learning trajectories. To address existing deficiencies, this research proposes a comprehensive innovative pathway comprising five core dimensions: establishing a robust centralized data platform, developing individualized ideological and political student profiles, creating immersive and intelligent learning scenarios, implementing proactive risk early-warning systems, and fundamentally reforming traditional evaluation frameworks. Ultimately, the overarching aim of this study is to facilitate the sustainable development of a precise, intelligent, and highly personalized new model for online ideological and political education, thereby significantly enhancing pedagogical effectiveness and student outcomes in vocational undergraduate institutions.

**Keywords:** big data; vocational education; political education; educational innovation; precision teaching

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## 1. Introduction

The internet has emerged as a critical platform for advancing ideological and political education within higher education institutions, significantly contributing to the overarching goal of fostering virtue and cultivating talent. In contemporary society, college students are deeply influenced by the pervasive presence of digital technologies, which introduce both challenges and opportunities for educational practices. These technologies demand innovative strategies to enhance moral development and talent cultivation. Traditional educational models are increasingly strained by the diverse and personalized needs of learners, which often require tailored approaches to ensure effective engagement [1, 2]. Additionally, there is a noticeable gap in the integration of curriculum content with real-world professional practices, which limits the practical applicability of academic learning. Furthermore, the evaluation criteria for educational outcomes remain insufficiently developed, making it difficult to comprehensively assess the effectiveness of educational initiatives. To address these issues, it is essential to harness modern information technologies to drive transformative advancements in

educational methodologies, ensuring that they are adaptive, integrative, and capable of meeting the evolving demands of the digital era [3, 4].

## **2. Current Status and Challenges of Online Ideological and Political Education in Vocational Undergraduate Institutions**

Currently, vocational undergraduate institutions widely employ digital platforms such as WeChat official accounts, campus apps, online course platforms, and thematic websites for ideological and political education, establishing a comprehensive online education ecosystem [5]. As a ubiquitous communication tool, WeChat official accounts serve as primary channels for daily ideological content dissemination. Most institutions maintain official accounts with branch accounts at the college level, regularly publishing analyses of current affairs, stories of exemplary individuals, and positive campus narratives. Campus apps integrate learning resources, lifestyle services, and interactive features, enabling students to conveniently access ideological course materials, participate in online discussions, and complete assignments. Specialized online course platforms deliver compulsory ideological courses—including "Introduction," "Fundamentals," and "Outline"—through recorded videos, live interactions, and assessment quizzes. Thematic websites develop structured knowledge frameworks addressing core topics like Party history education, ideological convictions, and professional ethics, creating digital spaces conducive to in-depth student learning. These platforms collectively aim to foster a robust digital ecosystem that supports ideological education while leveraging the accessibility and interactivity of online tools.

Despite the growing diversity of digital platforms for ideological and political education, practical implementation still faces significant challenges. The lack of organic integration among platforms has created pronounced "information silos," preventing cross-platform consolidation and analysis of students' learning trajectories and behavioral data, thereby hindering educational authorities from comprehensively assessing the overall effectiveness of such programs. Content delivery also exhibits homogenization tendencies, with most institutions providing similar educational materials lacking personalized designs tailored to diverse academic backgrounds, learning capacities, and student interests—a situation that reduces student engagement and acceptance. In classrooms, the traditional "cramming-style" teaching approach remains dominant in digital environments, lacking interactive elements and experiential components that fail to leverage the unique advantages of online media. Current evaluation systems predominantly rely on superficial metrics like exam scores and participation rates, failing to measure genuine shifts in students' ideological understanding and value systems. Vocational undergraduate students exhibit distinct characteristics—including strong practical orientation, intense employment pressure, and fragmented study schedules—which make traditional digital ideological education models incompatible with their cognitive patterns and learning habits, often resulting in superficial outcomes [6]. Furthermore, the absence of adaptive learning technologies and insufficient investment in innovative pedagogical tools exacerbate these challenges. In response to the demands of digital transformation and the fundamental mission of fostering moral integrity through education, vocational colleges urgently need to develop scientifically sound and effective innovative pathways for digital ideological education. This includes integrating artificial intelligence-driven analytics to personalize learning experiences, enhancing interactive features to boost student engagement, and establishing comprehensive evaluation frameworks that measure deeper ideological shifts beyond surface-level metrics.

## **3. The Advantages of Big Data in Enhancing Online Ideological and Political Education at Vocational Undergraduate Institutions**

### *3.1. Data-Driven Advantages in Precise Identification*

Students at vocational undergraduate institutions display a high degree of diversity, with notable variations in their ideological perspectives, value systems, and behavioral tendencies. Traditional methods of online ideological and political education often depend heavily on educators' subjective experiences and intuitive assessments, which can limit the ability to accurately gauge students' true ideological states and their unique educational needs. The application of big data technology introduces a transformative approach by enabling the comprehensive analysis of multidimensional behavioral data. This includes students' online learning patterns, social interaction activities, and digital content consumption preferences. By leveraging these data points, educators can construct detailed and dynamic student profiles that provide a holistic understanding of individual learners. Advanced machine learning algorithms further enhance this process by identifying specific gaps in students' ideological and political literacy and isolating critical factors that influence their value development. This data-driven precision mechanism allows for a departure from generalized, uniform teaching methods, paving the way for personalized and targeted educational strategies. Such an approach significantly improves the relevance and effectiveness of ideological and political education, ensuring that it resonates more deeply with students' individual experiences and developmental needs. Ultimately, this integration of big data fosters a more adaptive and impactful educational framework tailored to the diverse characteristics of vocational undergraduate students [7–9].

### *3.2. Advantages of Intelligent Allocation of Educational Resources*

The efficient allocation of online ideological and political education resources remains a significant challenge for educational administrators, particularly in ensuring that these resources reach the students who need them most [10]. Advanced big data platforms address this issue by employing sophisticated algorithms such as collaborative filtering and deep learning. These technologies enable the intelligent and targeted delivery of educational materials by analyzing a wide range of student characteristics, including academic backgrounds, learning progress, and personal interests. Based on this analysis, the system automatically selects and recommends tailored content, which may include theoretical articles, video materials, case studies, and interactive discussions. Furthermore, the platform continuously monitors the effectiveness of resource utilization, allowing for real-time adjustments to recommendation strategies and content prioritization. This dynamic approach ensures that high-quality educational materials are delivered efficiently and effectively, minimizing redundant resource development and avoiding inefficient investments. By shifting the paradigm from "people seeking content" to "content finding people," this intelligent allocation mechanism maximizes the educational value of resources. It fosters a more personalized and impactful learning experience, ensuring that students receive the most relevant and beneficial materials to support their academic and personal growth. This transformation represents a significant advancement in the field of educational resource management.

### *3.3. Advantages of Educational Effect Monitoring Throughout the Entire Process*

Big data technology offers a powerful foundation for creating comprehensive and continuous monitoring models to evaluate the effectiveness of educational processes. This system collects real-time behavioral data from students engaged in ideological and political education, capturing detailed metrics such as the duration of content engagement, frequency of interactions, tendencies in expressing opinions, and levels of knowledge acquisition. By employing advanced tools like natural language processing and sentiment analysis, the system can extract emotional and attitudinal trends from students' written responses, enabling the development of multi-dimensional evaluation frameworks. This data-driven approach facilitates the early detection of educational deficiencies, providing a scientific basis for making dynamic adjustments to teaching strategies. Educational administrators can leverage real-time feedback to identify instructional gaps with precision, refine teaching content and methodologies, and implement a closed-loop quality improvement mechanism. This mechanism, characterized by "monitoring-

feedback-improvement-remonitoring," ensures continuous enhancement of educational outcomes. Furthermore, the integration of these technologies promotes a more adaptive and responsive educational environment, aligning teaching practices with the evolving needs of students and fostering a more effective learning experience.

#### **4. Innovative Practice Paths of Online Ideological and Political Education in Vocational Undergraduate Institutions in the Era of Big Data**

##### *4.1. Establishing a Data Middle Platform to Connect Information Silos*

In the process of advancing digital transformation for online ideological and political education within vocational undergraduate institutions, the establishment of a unified data middle platform architecture is a critical step to address persistent system fragmentation issues [11–13]. This platform should be designed with standardized data protocols and interface specifications to facilitate seamless cross-departmental data sharing mechanisms. By aggregating multidimensional data, such as student participation in classroom discussions, involvement in extracurricular activities, internship performance evaluations, and library borrowing habits, institutions can conduct comprehensive correlation analyses to uncover valuable insights. Technologically, distributed data processing architectures should be implemented, utilizing API gateways to ensure interoperability across diverse systems while maintaining robust data security measures. Techniques such as differential privacy can be applied to anonymize sensitive personal information, enabling meaningful data analysis without compromising individual privacy rights. Effective data governance processes are essential, including the establishment of clear quality standards, automated workflows for data cleansing, intelligent methods for supplementing missing values, and mechanisms for detecting anomalies. Real-time data quality monitoring dashboards should be deployed to provide visibility into the integrity, accuracy, and timeliness of data across various business systems. Furthermore, a data lineage tracing mechanism must be implemented to document the origin, transmission paths, and usage patterns of each data entry, ensuring transparency and reliability for subsequent analytical applications. By integrating these advanced methodologies, vocational institutions can create a robust framework that not only enhances the efficiency of data utilization but also supports the broader goals of ideological and political education in the era of big data.

##### *4.2. Develop Ideological and Political Profiles for Targeted Intervention*

Vocational undergraduate institutions can leverage machine learning algorithms to deeply mine multidimensional information aggregated from data platforms, thereby establishing comprehensive student profiles for targeted educational support across four core dimensions: political identity, moral cultivation, legal awareness, and professional ethics. Within a standardized educational governance framework, the algorithmic model can first conduct quantitative analysis of behavioral data, including classroom interaction frequency, homework completion quality, participation in student organizations, attendance stability, and internship performance evaluations. By integrating online learning trajectories, discussion forum posts, reflective journals, and survey feedback, it can generate multidimensional tagging patterns that reflect cognitive levels, value orientations, participation tendencies, and behavioral characteristics. On this basis, the system can identify differences in educational needs among student groups with greater precision and then formulate corresponding personalized recommendation strategies. For students with weak theoretical foundations, the platform can automatically deliver foundational learning packages that combine visual resources, short interactive micro-courses, and staged review tasks. For groups with unclear value judgment or insufficient engagement, the system can prioritize case-based learning materials, guided discussion topics, and scenario reflection exercises. Taking the Nursing program as an example, if the system identifies deficiencies in professional ethics awareness among certain students, it can accurately recommend specialized content on doctor-patient communication, patient privacy protection, informed consent, and bioethical decision-making. The system

can also incorporate virtual ward scenarios to enable students to experience realistic ethical conflict situations in simulated environments [14]. When students address cases involving family requests to conceal medical conditions, the system can record their decision-making pathways, response time, option preferences, and explanatory rationale, and then dynamically adjust the difficulty and focus of subsequent recommendation content. In practical application, such a model may further combine early-warning thresholds, periodic diagnostic reports, and teacher review mechanisms to improve interpretability and educational safety. This data-driven personalized education model based on student profiling effectively addresses the common one-size-fits-all tendency in traditional online ideological and political education. It helps ensure that each student receives content suited to individual cognitive development, disciplinary background, and practical learning context, thereby enhancing educational relevance, participation quality, and overall instructional effectiveness.

#### *4.3. Building Intelligent Scenarios and Embedding Professional Contexts*

Vocational colleges should utilize big data technology to construct immersive virtual simulation environments for ideological and political education, seamlessly integrating abstract value education into practical professional scenarios [15]. The development of these environments necessitates close collaboration with industry enterprises to gather representative cases of ethical conflicts and moral decision-making situations across various professional domains. This collaboration enables the creation of a comprehensive scenario resource library that encompasses diverse occupational roles. Advanced technologies such as virtual reality and artificial intelligence algorithms can be employed to replicate realistic work settings, allowing students to engage with value-based dilemmas during simulated professional tasks. Each scenario should be meticulously designed to include multiple decision-making points, where every student choice triggers corresponding outcomes and prompts for ethical analysis. For instance, in the "E-commerce" program, the system can simulate integrity challenges faced during online store operations. When encountering quality defects in best-selling products, students must decide between "immediate product removal to minimize losses" and "continuing sales to maintain profits." The scenario can incorporate complex variables such as supplier demands, consumer complaints, and competitive market pressures. Students who choose the "integrity-driven approach" may experience short-term sales declines but gain consumer trust, ultimately enhancing brand value over time. The system can also provide relevant business ethics case studies and legal guidelines to reinforce learning. Conversely, students opting for the "profit-first approach" may face severe repercussions, including escalating consumer disputes, regulatory penalties, and significant reputational damage to their enterprises. Throughout the simulation, the big data system continuously monitors students' thought processes, decision-making rationales, and value orientations in real time. It then automatically generates personalized ideological and political literacy reports. These reports serve as a scientific basis for subsequent targeted education, effectively bridging the gap between theoretical instruction and practical application. By embedding professional contexts into educational scenarios, vocational colleges can foster a deeper understanding of ethical principles and their implications in real-world professional environments.

#### *4.4. Establishing Early Warning Models for Preemptive Risk Intervention*

Vocational undergraduate institutions can utilize advanced multi-source data fusion technology to systematically gather unstructured textual information generated by students in various digital environments, including online communities, course discussion forums, and anonymous feedback platforms. By integrating deep learning algorithms, these systems are capable of performing intelligent semantic analysis. The preprocessing workflow involves critical steps such as noise reduction, word segmentation, and part-of-speech tagging, which are followed by the application of sentiment analysis models to discern emotional tendencies expressed by users. The foundation of the early warning model is a multi-tiered risk identification framework. At

the primary level, the system monitors extreme individual statements and persistent negative emotional fluctuations. At the intermediate level, it tracks abnormal dissemination patterns of group-related topics [16, 17]. Finally, at the advanced level, it focuses on the escalation of sensitive issues that could potentially trigger collective behaviors. When the algorithms detect abnormal signals that exceed predefined thresholds, the system automatically generates comprehensive warning reports. These reports include essential details such as risk levels, affected populations, and potential triggers, which are then promptly delivered to the work terminals of relevant counselors and ideological and political educators. For instance, in the "Mechanical Manufacturing" program, during the final exam period, the system identified multiple students frequently using negative terms such as "overwhelmed by pressure," "can't take it anymore," and "want to quit" in professional QQ groups. The sentiment analysis module determined that the group's anxiety index had surpassed warning thresholds for three consecutive days. In response, the early warning model consolidated critical information, including student lists, emotional fluctuation curves, and key discussion topics, and delivered this data to class counselors. Armed with these insights, counselors were able to implement timely and targeted psychological counseling and academic support measures. This proactive approach effectively mitigated the risk of potential collective psychological crises, ensuring a more stable and supportive academic environment for students.

#### *4.5. Restructuring the Evaluation System to Drive Continuous Improvement*

The reconstruction of evaluation systems for online ideological and political education in vocational colleges necessitates the establishment of a multidimensional, end-to-end assessment mechanism that leverages advanced big data technology. This innovative model integrates diverse data sources, including metrics related to learning behaviors, interactive participation, and emotional attitudes, to create a comprehensive evaluation framework. This framework encompasses cognitive, behavioral, and affective dimensions, ensuring a holistic approach to student assessment. Cognitive evaluation should move beyond simplistic tests of knowledge mastery, employing advanced techniques such as learning trajectory analysis and knowledge mapping. These methods assess students' internalization of ideological theories and their ability to apply these concepts in practical scenarios [3, 17]. Behavioral evaluation, on the other hand, utilizes data from campus access cards, learning management systems, and social media platforms to identify students' value orientations and ethical practices as demonstrated in their daily interactions. Emotional evaluation employs sentiment analysis technology to examine students' emotional expressions during online engagements, providing insights into their authentic attitudes and levels of recognition toward ideological content. For instance, in the context of "Automotive Maintenance Technology" instruction, educators can design digital evaluation systems that incorporate professional ethics, craftsmanship spirit, and safety responsibilities. These systems can collect decision-making data from students as they handle customer complaints and quality issues in virtual training environments. By integrating data from online discussion participation, assignment quality, and peer review outcomes, comprehensive evaluation reports can be generated. These reports combine assessments of professional competence with ideological literacy, offering targeted guidance for student development. Furthermore, the system establishes a closed-loop teaching feedback mechanism. When algorithms detect collective learning gaps, the system automatically provides customized instructional recommendations to educators, enabling dynamic adjustments to the content of ideological education. This data-driven evaluation model addresses the limitations of traditional, singular, and summative assessments. It achieves the goals of diversified evaluators, a continuous evaluation process, and the maximized application of evaluation outcomes. Ultimately, this approach provides robust support for enhancing the quality of online ideological and political education in vocational undergraduate institutions, ensuring that the educational process remains adaptive, comprehensive, and effective in meeting the evolving needs of students and educators alike.

## 5. Conclusion

Online ideological and political education in vocational undergraduate institutions is undergoing a pivotal transformation driven by the integration of big data technology, which offers substantial opportunities for educational innovation and reform. By leveraging data analytics and intelligent systems, institutions can create a more precise and adaptive framework for ideological and political education, ensuring that students not only achieve academic excellence but also develop strong moral and ethical foundations. This approach has the potential to cultivate a generation of professionals who are well-equipped to meet the demands of a skills-based society, contributing to sustainable economic and social development. To fully realize these benefits, it is imperative to deepen the synergy between technological advancements and their practical applications within educational settings. This includes fostering interdisciplinary collaboration among educators, technologists, and policymakers to design systems that are both effective and scalable. Furthermore, robust institutional safeguards must be established to address challenges such as data privacy, system reliability, and equitable access to technology. Future research should focus on refining predictive models, exploring the integration of artificial intelligence, and assessing the long-term impacts of these systems on student outcomes and societal progress. By prioritizing these efforts, vocational undergraduate institutions can set a benchmark for high-quality online ideological and political education, ultimately providing essential talent and intellectual resources for the advancement of a skills-driven economy.

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