

Big Data-Driven Precision in College Ideological and Political Education: Design and Practice of Personalized Guidance Programs in Student Management Scenarios

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ABSTRACT Big data-driven precision ideological and political education uses multidimensional student data to meet the demand for innovative talent cultivation in colleges and universities. Based on the theoretical logic of big data technology and personalized ideological and political education, this paper focuses on student-management scenarios and constructs a personalized guidance program featuring “data collection-intelligent analysis-precise delivery-feedback optimization.” By integrating behavioral data, ideological dynamics, academic development data, and psychological information, machine learning algorithms are used to build students’ ideological and behavioral profiles, enabling precise matching of educational content, methods, and timing. Taking 2,000 students from three different types of colleges as research subjects, an empirical study conducted over one academic year shows that the program significantly improves students’ ideological recognition, behavioral standardization, and academic achievement rates. The results verify the feasibility and effectiveness of big data-driven precision ideological and political education and provide a replicable paradigm for scientific transformation of student management in the new era.

INDEX TERMS big data, ideological and political education, precision guidance, student management, learner profile

I. INTRODUCTION

A. RESEARCH BACKGROUND

THE Report to the 20th National Congress of the Communist Party of China clearly proposes “cultivating people with socialist core values, improving the ideological and political work system, and promoting the integrated construction of ideological and political education in primary, secondary, and higher education” [1]. The continuous expansion of college enrollment reflects the growing demand for specialized talent within the modern industry, leading to a yearly increase in the number of students dedicated to this evolving field. The number of ideological and political education workers in colleges is far from meeting the growth rate of students, making the ideological and political education work for students significantly more complex and arduous [2-4]. In the context of the digital and intelligent era, big data and intelligent technologies, as products of the information age, are leading a new round of technological revolution and are deeply integrated with structural elements such as the goals, environment, and methods of ideological and political education [5]. Educators can grasp the ideolog-

ical dynamics of educated individuals, reform educational methods, and transform educational carriers, thereby achieving the goals of accurately understanding students’ needs, precisely providing teaching content, and accurately evaluating teaching quality to a greater extent [6, 7]. Therefore, targeted ideological and political education in colleges is a response to the trends of the big data era and a requirement for innovating college ideological and political education [8]. “Precision ideological and political education” is an educational concept targeting college students in the new era, taking their ideological and behavioral characteristics and personalized, differentiated needs as the starting point [9]. It is an innovative practice in the “Internet +” environment and an important starting point for the innovative development of college ideological and political education in the new era [10,11]. On this basis, exploring the realization paths of targeted ideological and political education within the context of industry upgrading holds profound theoretical value and practical significance for fostering high-caliber professionals. In the process of empowering college development, big data not only promotes curriculum teach-

ing and scientific research but also inevitably significantly advances college student management. It should cover all aspects of students' study and life and become an important means for colleges to cultivate modern talents [12-14]. If teaching and scientific research focus more on enhancing students' knowledge, student management focuses more on achieving the goal of moral education. The development of the Internet has provided different research paths and practical foundations for the renewal and transformation of ideological and political education in schools. Teachers have transformed educational concepts and used the power of "Internet +" to help students achieve personalized learning. With the rapid transformation of college students' learning methods, especially the emergence of personalized learning, innovating college students' learning models, improving the teaching methods of college ideological and political education, optimizing the construction of online resources for college ideological and political education, and promoting higher education reform have become important issues in the fields of ideological and political education and higher education.

B. RESEARCH STATUS

Precision thinking is the most direct theoretical source of big data-driven personalized ideological and political education. Based on materialist dialectics and epistemology, precision thinking is a cognitive, analytical, and work method aimed at improving national governance efficiency and pursuing precision, meticulousness, and rigor [15]. Applied to college ideological and political education and continuously enriched and developed, precision thinking has ultimately formed the concept of precision ideological and political education. In terms of content coverage, "refinement" and "accuracy" are the content principles of precision ideological and political education, including accurately positioning educational goals, precisely identifying educational objects, elaborately designing educational content, accurately judging educational timing, precisely selecting educational methods, and accurately forming educational teams. In terms of characteristics, precision ideological and political education is a process of adhering to problem awareness, comprehensively promoting students' development, and targeted improving their ideological and moral levels. As an innovative application of precision thinking in the field of ideological and political education, precision ideological and political education is a practical activity that relies on modern information technology to comprehensively and whole-process accurately grasp educational objects, promoting the realization of "precision drip irrigation" in college ideological and political education.

Many scholars have conducted research on the construction of college precision ideological and political education under the background of big data. Zou Guozhen (2021) believes that big data analysis helps to accurately supply educational content, dynamic monitoring of big data helps to accurately control the educational process, and

the construction of a big data evaluation system helps to accurately evaluate educational effects [16]. Zhang Dong et al. argue that big data technology is highly consistent with the requirements of precise supply of college ideological and political education, and using the precision characteristics of big data to achieve precise educational supply is an inherent requirement [17]. The dual-edged sword nature of big data is particularly evident in the construction of college precision ideological and political education. In the practice of ideological and political education in the big data era, limitations in data sources and collection technologies may lead to one-sidedness in college ideological and political education data, resulting in incomplete and objective profiles of educated individuals. Inaccurate data will lead to uncertain results. Dong Zhuoning (2018) believes that properly handling the tool, thinking, and method attributes of big data, conducting more interdisciplinary research and exploration, and addressing the negative attributes of data will contribute to the practice of precision ideological and political education [18]. Research on the personalization of ideological and political education in China focuses on exploring theoretical bases, practical significance, and other dimensions, tending to demonstrate from a theoretical perspective. Zhang Yaocan et al. believe that ideological and political education needs to promote both individual development and individual socialization [19]. Yang Lin et al. argue that the personalization of ideological and political education should fully respect human subjectivity [20]. Huang Zhengquan holds that ideological and political education should focus on caring for students [21]. Wu Wenbin's research affirms the feasibility of college students' personalized development [22]. Wei Yanping believes that integrating personalization into ideological and political education is necessary and feasible, and proposes new ideas for reform from five aspects including educational concepts, educational content, and teaching staff [23]. From the perspective of the information age, Zhou Bin optimizes traditional educational methods, updates educational content, and promotes students' personalized learning [24]. It can be seen that most scholars believe that we should establish the concept of individual and all-round development, enhance the pertinence of learning content for students, enrich the interactive forms of ideological and political education, and improve the quality of the educational team.

C. RESEARCH SIGNIFICANCE

- 1) Provide an operable personalized guidance program for college ideological and political education. By accurately identifying students' ideological confusions, behavioral deviations, and development needs, achieve the precise matching of ideological and political education content, methods, and timing.
- 2) Assist in the transformation of college student management models. Through big data analysis, realize early warning of student risks and precise policy implementation for problems, reduce management costs, and improve man-

agement efficiency.

3) Provide personalized support for students' all-round development. By building dynamically updated student growth profiles, provide students with customized ideological and political education, academic guidance, mental health services, etc.

II. DESIGN OF PERSONALIZED GUIDANCE PROGRAM IN STUDENT MANAGEMENT SCENARIOS

A. PRINCIPLES OF PROGRAM DESIGN

1) Moral Education Principle

Adhere to the political attribute and educational essence of ideological and political education, and take moral education as the fundamental principle of program design.

2) Data-Driven Principle

Take students' multi-dimensional data as the core support, running through the entire process of program design, implementation, and evaluation:

- Achieve precise student profiling through data collection and integration;
- Identify students' needs and risks through data analysis and mining;
- Adjust and optimize guidance strategies through data feedback.

3) Personalized Adaptation Principle

Fully respect students' individual differences and formulate differentiated guidance programs for students of different grades, majors, personalities, and development needs.

4) Scenario Embedding Principle

Closely integrate with the core scenarios of student management, and embed personalized guidance into specific scenarios such as academic development, behavioral norms, mental health, and value guidance.

5) Ethical and Compliance Principle

Strictly abide by relevant laws and regulations on data security and privacy protection, and establish and improve standardized processes for data collection, storage, use, and sharing. To address privacy concerns, a multi-level privacy protection mechanism is added, including explicit informed consent procedures, data desensitization processing, and real-time monitoring of data access behavior. Students have the right to inquire about and modify their personal data involved in the program at any time.

B. OVERALL FRAMEWORK OF THE PROGRAM

1) Data Collection and Integration Module

Data collection and integration are the foundation of program implementation, aiming to build a comprehensive, accurate, and dynamic student data resource library. The collected content covers four categories of data:

(1) Basic attribute data:

Including static data such as students' name, gender, age, grade, major, place of origin, family background, and political status.

(2) Academic development data:

Including course grades, attendance records, homework completion, participation in scientific research projects, innovation and entrepreneurship competitions, paper publications, and academic early warning records.

(3) Behavioral dynamic data:

Including dormitory access records, library borrowing records, campus consumption data, online behavioral data (browsing content, online duration, social interaction), participation in community activities, volunteer service hours, and social practice experience.

Rational consumption: it refers to consumption behavior that is compatible with students' economic conditions, meets basic study and living needs, and does not involve excessive consumption or wasteful spending. The data is analyzed in combination with students' family economic background and consumption purpose to avoid subjective bias.

(4) Ideological and psychological data:

Including mental health assessment results, performance in ideological and political courses, speeches in theme class meetings, online speech tendencies, party application materials, ideological reports, and psychological counseling records.

Data integration adopts a "distributed storage + centralized management" model. Through data interfaces connecting various department systems, ETL (Extract-Transform-Load) tools are used to clean, transform, and deduplicate data, eliminate data silos, and build a unified big data resource library for college students' ideological and political education, ensuring data consistency and usability. Detailed data cleaning protocols for ETL tools: for missing data, multiple imputation methods are used based on the type of data (continuous data adopts mean imputation combined with regression imputation; categorical data adopts mode imputation); for erroneous data, outlier detection algorithms (such as Z-score method and IQR method) are used to identify and verify with the original data source before correction or deletion.

2) Data Processing and Analysis Module

Data processing and analysis are the core links of the program, aiming to mine potential laws of students' ideological and behavioral from massive data and identify students' development needs and potential risks. This module adopts a combination of "quantitative analysis + qualitative analysis" methods:

(1) Quantitative data analysis:

- Use descriptive statistics, correlation analysis, cluster analysis, and other methods to analyze the correlation between students' academic performance and behavioral data, and differences in behavioral characteristics among different groups of students;

- Use machine learning algorithms to build prediction models to predict students' academic risks, behavioral risks, and psychological risks.

(2) Qualitative data analysis:

Use Natural Language Processing (NLP) technology to extract keywords from text data such as students' ideological reports, online speeches, and psychological counseling records, and quantify qualitative data into analyzable indicators. The multi-layered NLP analysis framework is: first, construct a domain-specific lexicon for ideological and political education (including 500+ core words related to family and country feelings, ideals and beliefs, etc.) through expert consultation; second, use sentiment analysis combined with semantic role labeling to identify the context and emotional tendency of relevant expressions; finally, establish a weighted scoring system based on the frequency, relevance, and depth of core words, with scoring criteria verified by three independent experts (Kappa coefficient = 0.87, indicating high consistency). The entire process is visualized to explain the conversion logic from text data to scores.

3) Student Profiling Module

Based on the results of data processing and analysis, build multi-dimensional and dynamic students' ideological and behavioral profiles. The student profile includes four core dimensions (see Table 1).

The student profile adopts a dynamic update mechanism, which adjusts indicator scores and labels in real-time based on students' latest data to ensure that the profile can accurately reflect students' latest status.

4) Precision Guidance Implementation Module

Based on students' ideological and behavioral profiles and combined with the four core scenarios of student management, formulate and implement personalized guidance strategies (see Table 2).

5) Feedback and Optimization Module

The feedback and optimization module is crucial to ensuring the dynamic improvement of the program. It collects feedback information through multiple channels and continuously adjusts and optimizes the program. The specific process includes:

(1) Feedback data collection: Collect feedback data through student satisfaction surveys, evaluation of guidance implementation effects, feedback from counselors, and changes in data monitoring indicators. Student satisfaction surveys are conducted online anonymously twice a semester.

(2) Feedback analysis: Use statistical analysis methods to process feedback data and identify existing problems in the program.

(3) Program optimization: Based on the results of feedback analysis, adjust and optimize each module of the program, such as adjusting the weight of student profile indicators,

updating the guidance content library, and optimizing algorithm model parameters.

(4) Iterative implementation: Apply the optimized program to personalized guidance in the next stage, forming a closed-loop iterative mechanism of "implementation - feedback - optimization - reimplementation."

III. PRACTICAL VERIFICATION OF THE PERSONALIZED GUIDANCE PROGRAM

A. PRACTICAL OBJECTS

(1) Technical environment:

- Build a big data platform for college ideological and political education, connecting various college systems such as student registration management system, academic affairs management system, student work management system, and mental health center system to achieve real-time data synchronization;
- Configure high-performance servers (32-core CPU, 64GB memory, 10TB storage) to ensure data processing and platform operation efficiency.

(2) Organizational environment:

Establish a special working group composed of ideological and political departments, student work departments, academic affairs departments, mental health centers, network centers, and other departments.

(3) Personnel training:

Train counselors, professional supervisors, mental health teachers, and other practitioners on the application of big data technology, platform operation, and personalized guidance methods.

B. PRACTICAL PROCESS

The practice cycle is one academic year (2 semesters), divided into three stages:

1) Preparation Stage (Weeks 1-8)

- Complete data interface docking and data collection, and build an initial student data resource library;
- Clean, integrate, and preprocess the collected data;
- Collect historical data of students (including academic performance, behavioral records, and ideological assessment results from the previous semester) as supplementary data sources for building initial profiles;
- Train machine learning algorithm models and complete the construction of initial ideological and behavioral profiles for experimental group students;
- Formulate personalized guidance programs for various scenarios.

2) Implementation Stage (Weeks 9-24)

Carry out precision guidance work in accordance with the personalized guidance program:

- Implementers such as counselors, professional supervisors, and mental health teachers carry out guidance activities through a combination of online and offline

TABLE 1. Core Dimensions and Evaluation Indicators of Students' Ideological and Behavioral Profiles

Profile Dimension	Core Evaluation Indicators	Data Source	Weight
Academic Development Dimension	Average GPA, number of failed courses, scientific research participation, innovation and entrepreneurship achievements, clarity of academic planning	Academic affairs management system, scientific research management system	0.3
Behavioral Norm Dimension	Compliance with school rules and discipline, dormitory hygiene scores, volunteer service hours, participation in community activities, rationality of campus consumption	Student work management system, dormitory management system, campus card system	0.25
Mental Health Dimension	Mental health assessment score, emotional stability, stress level, number of psychological counseling sessions, frequency of social interaction	Mental health center, online behavioral data	0.25
Value Guidance Dimension	Ideological and political course scores, quality of ideological reports, enthusiasm for joining the Party, positivity of online speeches, performance of family and country feelings	Ideological and political course teaching platform, student work management system	0.2

TABLE 2. Framework of Personalized Guidance Strategies in Different Scenarios

Student Management Scenario	Guidance Goals	Core Guidance Content	Guidance Methods
Academic Scenario	Improve academic performance, clarify development direction	1. Students with academic difficulties: customized make-up plans, learning method guidance; 2. Students interested in scientific research: recommend supervisors, scientific research projects	1. Online: customized push on learning platforms, one-on-one video tutoring; 2. Offline: small-class tutoring, supervisor interviews, scientific research salons
Behavioral Norm Scenario	Strengthen rule awareness, cultivate good habits	1. Students with behavioral deviations: thematic education on school rules and discipline, behavioral correction plans; 2. Actively participating students: volunteer service expansion, backbone training	1. Online: push of behavioral norm microcourses, sharing of model cases; 2. Offline: theme class meetings, practical activities, one-on-one interviews
Mental Health Scenario	Alleviate psychological pressure, maintain emotional stability	1. Students with high pressure: emotional regulation skills training, stress counseling; 2. Students in psychological crisis: professional psychological counseling, crisis intervention	1. Online: mental health assessment, push of meditation audio, anonymous counseling; 2. Offline: individual counseling, group counseling
Value Guidance Scenario	Strengthen ideals and beliefs, cultivate core values	1. Students with ideological confusion: thematic education on ideals and beliefs, model guidance; 2. Actively progressing students: Party membership training, theoretical research	1. Online: push of red resources, theoretical learning communities; 2. Offline: theme Party classes, social practice, red research tours

methods based on the guidance tasks pushed by the platform;

- The platform records the implementation of guidance and student feedback data in real-time, updates students' ideological and behavioral profiles every half a month, and dynamically adjusts guidance strategies.
- The control group adopts traditional ideological and political education models, including regular ideological and political classroom teaching, theme class meetings, and random heart-to-heart talks.

To ensure the comparability of the two groups, a stratified random sampling method was used for group division: first, students were stratified by major, grade, and baseline academic ability (average GPA of the previous semester); then, 1,000 students were randomly selected from each stratum to form the experimental group and the control group. The baseline data of the two groups (including academic performance, behavioral compliance rate, and ideological recognition score) were tested for homogeneity of variance ($p > 0.05$), indicating no significant difference between the groups. This study was approved by the Ethics Committee of North university of China, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

3) Evaluation Stage (Weeks 25-26)

- Evaluate the practical effect through multi-dimensional indicators, including quantitative indicators (academic

performance, behavioral norm compliance rate, mental health assessment score, etc.) and qualitative indicators (students' ideological recognition, satisfaction, etc.);

- Collect relevant data of the experimental group and the control group for comparative analysis;
- Conduct work summary and feedback from the special working group and implementers.

C. ANALYSIS OF PRACTICAL EFFECTS

1) Evaluation Index System

Construct a practical effect evaluation index system including 4 first-level indicators and 12 second-level indicators (see Table 3). The weighted sum method is used to calculate the comprehensive effect score, and the weights are determined by the Analytic Hierarchy Process (AHP).

2) Quantitative Effect Comparison

After the practice, the comparison results of various indicator data between the experimental group and the control group are shown in Table 4. The experimental group performed significantly better than the control group in all first-level and second-level indicators.

The relatively small standard deviation in the experimental group is due to the targeted guidance of the program. For students with large individual differences at the baseline, personalized intervention measures were adopted to help them make significant progress, thereby reducing the overall variance. In addition, subgroup analysis was conducted by

TABLE 3. Practical Effect Evaluation Index System and Weights

First-Level Indicators	Weight	Second-Level Indicators	Weight	Evaluation Method
Ideological Recognition	0.3	Ideological and political theory recognition score	0.15	Questionnaire survey
Ideological Recognition	0.3	Core values practice degree	0.1	Quantitative analysis of behavioral data
Ideological Recognition	0.3	Enthusiasm for Party application	0.05	Growth rate of applicants
Behavioral Standardization	0.25	Violation rate of school rules and discipline	0.1	Records from student work management system
Behavioral Standardization	0.25	Volunteer service participation rate	0.08	Statistics of activity participation data
Behavioral Standardization	0.25	Dormitory norm compliance rate	0.07	Scores from dormitory management center
Academic Achievement	0.25	Average GPA improvement range	0.1	Comparison of scores from academic affairs system
Academic Achievement	0.25	Failed course rate reduction range	0.08	Statistics of scores from academic affairs system
Academic Achievement	0.25	Scientific research/innovation and entrepreneurship participation rate	0.07	Records from scientific research management system
Mental Health Level	0.2	Average mental health assessment score	0.1	Assessment data from mental health center
Mental Health Level	0.2	Psychological counseling help-seeking rate (reverse indicator)	0.05	Statistics of counseling records
Mental Health Level	0.2	Emotional stability score	0.05	Sentiment analysis of online behavior

TABLE 4. Quantitative Comparison of Practical Effects between Experimental Group and Control Group

Indicator Name	Experimental Group(n=1000)	Control Group(n=1000)	Difference Range
Comprehensive score of ideological recognition (full score 100)	82.36±5.21	73.15±6.89	+9.21
Ideological and political theory recognition score (full score 5)	4.12±0.45	3.58±0.52	+0.54
Core values practice degree (full score 100)	85.63±7.12	76.42±8.35	+9.21
Enthusiasm for Party application (growth rate)	28.3%	15.6%	+12.7%
Comprehensive score of behavioral standardization (full score 100)	88.45±4.36	79.23±5.78	+9.22
Violation rate of school rules and discipline	3.2%	8.7%	-5.5%
Volunteer service participation rate	65.8%	42.3%	+23.5%
Dormitory norm compliance rate	92.5%	81.6%	+10.9%

TABLE 4. Quantitative Comparison of Practical Effects between Experimental Group and Control Group (continued)

Indicator Name	Experimental Group(n=1000)	Control Group(n=1000)	Difference Range
Comprehensive score of academic achievement (full score 100)	83.76±6.12	75.34±7.25	+8.42
Average GPA improvement range	0.45±0.18	0.12±0.15	+0.33
Failed course rate reduction range	12.3%	4.6%	+7.7%
Scientific research/innovation and entrepreneurship participation rate	38.5%	21.7%	+16.8%
Comprehensive score of mental health level (full score 100)	86.24±5.36	78.15±6.42	+8.09
Average mental health assessment score (full score 100)	88.35±4.21	80.26±5.13	+8.09
Psychological counseling help-seeking rate	4.2%	7.8%	-3.6%
Emotional stability score (full score 100)	85.67±5.42	77.34±6.25	+8.33

college type, and the results showed that there were significant differences in the improvement effects of each indicator among different types of colleges ($p < 0.05$), indicating that the data can reflect real-world variance. The detailed subgroup analysis results are provided in the supplementary materials.

3) Qualitative Effect Analysis

Anonymous questionnaires and in-depth interviews with students in the experimental group show that:

- 89.6% of students believe that the personalized guidance program is “highly targeted” and can solve their actual confusions;
- 86.3% of students are “satisfied” with the guidance content and methods, believing that the combination of online and offline guidance methods is more attractive;
- 82.5% of students indicate that through personalized guidance, their ideals and beliefs have become more firm, and their behavioral habits have been significantly

improved.

In addition, counselors participating in the practice feedback that the application of big data technology has improved the efficiency of student management work by more than 40%, enabling accurate identification of students requiring key attention. The average time spent by counselors on student management per week before the program was 16.8 hours; after the program was implemented, it was reduced to 9.2 hours. The main reasons for the efficiency improvement are:

- 1) The big data platform automatically identifies students at risk and pushes key tasks, reducing the time for manual screening (saving 3.5 hours/week).
- 2) The online guidance module (such as customized learning resource push and video tutoring) replaces part of the offline repetitive work (saving 2.8 hours/week).
- 3) The dynamic update of student profiles enables counselors to grasp student status in realtime, avoiding ineffective communication (saving 1.3 hours/week).

IV. EXISTING PROBLEMS AND OPTIMIZATION SUGGESTIONS IN PRACTICE

A. MAIN EXISTING PROBLEMS

1) Insufficient Data Quality and Integration

- Data standards of various systems in some colleges are not unified, with problems such as data duplication, missing, and errors, affecting the accuracy of profile construction;
- The collection channels for qualitative data such as ideological and psychological data are limited, making quantitative processing difficult and data granularity insufficiently refined.

2) Need for Improvement in Algorithm Model Interpretability and Adaptability

- The “black box” nature of existing machine learning algorithm models makes it difficult to explain the generation logic of guidance strategies to counselors and students, reducing the acceptance of the program;
- The model’s adaptability to students from different types of colleges and different majors is insufficient, and the pertinence of some guidance strategies needs to be strengthened.

3) Risks of Data Ethics and Privacy Protection

Despite the formulation of ethical and compliance principles, there are still potential risks of data leakage and abuse in practice.

4) Imperfect Multi-Subject Collaboration Mechanism

- The collaborative cooperation between ideological and political departments, academic affairs departments, mental health centers, and other departments is not smooth enough, there are barriers to data sharing, and some guidance tasks suffer from responsibility shirking and inadequate implementation;
- The participation of external subjects such as students and parents is relatively low.

B. OPTIMIZATION SUGGESTIONS

1) Improve Data Quality and Integration Level

- (1) Establish a unified data standard system, standardize the collection format and field definitions of data from various systems, and regularly conduct data cleaning and verification.
- (2) Expand qualitative data collection channels, optimize natural language processing algorithms, and improve the accuracy of quantitative analysis of qualitative data.
- (3) Construct a data quality evaluation index system, regularly evaluate data completeness, accuracy, and timeliness to ensure data quality.

2) Optimize Algorithm Models and Guidance Strategies

- (1) Introduce interpretable machine learning algorithms combined with deep learning models to improve the transparency and interpretability of the program, and clearly

present the basis for generating guidance strategies to implementers and students.

- (2) Optimize model parameters according to the characteristics of students from different types of colleges and different majors, build classified algorithm models, and enhance the pertinence of guidance strategies.

- (3) Establish a guidance content resource library, integrate various high-quality resources such as red education, academic guidance, and mental health, regularly update resource content, and enrich guidance forms.

3) Strengthen Data Ethics and Privacy Protection

- (1) Improve data management systems, clarify the authority and processes for data collection, storage, use, and sharing, establish data access logs and audit mechanisms, and strengthen supervision over data use.

- (2) Strictly follow the “minimum necessary” principle, only collect data necessary for ideological and political education and student management, fully inform students of the purpose, scope, and protection measures of data use, and safeguard students’ right to know and right to choose.

- (3) Strengthen technical protection of data security, adopt technical means such as encrypted storage, access control, and data desensitization to prevent data leakage risks.

4) Improve the Multi-Subject Collaboration Mechanism

- (1) Establish a regular collaborative working mechanism, set up a leading group for the application of big data in ideological and political education led by school leaders, and hold regular cross-departmental coordination meetings.

- (2) Clarify the responsibility list of each department in personalized guidance, and establish a full-process management mechanism of “task assignment - implementation - feedback - assessment.”

- (3) Broaden the participation channels of external subjects, feedback students’ growth status to parents to gain their support, and encourage students to participate in the design and evaluation of guidance programs.

V. CONCLUSIONS

Focusing on the precision required for cultivating high-end talent, this study takes core student management scenarios as the entry point to construct a big data-driven personalized guidance program aligned with the intelligent transformation of the industry. The core conclusions are as follows:

- 1) Big data technology provides an effective path to solve the problem of “one-size-fits-all” in traditional ideological and political education. By integrating four types of data including students’ basic attributes, academic development, behavioral dynamics, and ideological psychology, and using a combination of quantitative and qualitative analysis methods, it is possible to accurately identify students’ individual differences, development needs, and potential risks, providing scientific data support for personalized guidance.
- 2) The constructed closed-loop program of “data collection - data processing - intelligent analysis - precision guidance -

feedback optimization” has strong operability and effectiveness. By integrating the meticulous standards of engineering into the educational framework, the program achieves precise positioning of students through multi-dimensional profiles, formulating “one student, one policy” strategies that align academic development and value guidance with the professional rigor required by the modern industry. Practical verification shows that the experimental group is significantly superior to the control group in core indicators such as ideological recognition, behavioral standardization, academic achievement rate, and mental health level, fully proving the practical value of the program.

3) The realization of big data-driven precision in ideological and political education requires balancing technological application and humanistic care, as well as data value and ethical compliance. Problems exposed in practice such as data quality, algorithm interpretability, privacy protection, and collaboration mechanisms need to be solved through multi-dimensional measures such as technological optimization, system improvement, and mechanism innovation to achieve the sustainable development of precision in ideological and political education.

AUTHOR CONTRIBUTIONS

Xiuling Li designed, collected and analyzed the data, and drafted the manuscript. Xiuling Li conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Xiuling Li participated fully in the work, took public responsibility for appropriate portions of the content, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICTS OF INTEREST

The author declares no conflict of interest.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethics Committee of North university of China, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

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