

Construction and Effect Evaluation of AI-Empowered Personalized Teaching Model for Ideological and Political Education in Colleges and Universities

Jia Liu¹

¹Marxist College, Inner Mongolia University of Finance and Economics, Hohhot 010070, Inner Mongolia, China

Corresponding author: Jia Liu (e-mail: m13488548381@163.com)

ABSTRACT With the rapid development of artificial intelligence technology, digital transformation in education is accelerating, and ideological and political education in colleges and universities faces the dual tasks of teaching-model innovation and effectiveness improvement. Traditional models are characterized by homogeneous content, single teaching methods, and one-sided evaluation, making it difficult to meet the personalized growth needs of college students. Based on constructivist learning theory, precision teaching theory, and intelligent education theory, this paper proposes an AI-empowered personalized teaching model for ideological and political education and designs its operational mechanism from four dimensions: intelligent adaptation of teaching resources, dynamic regulation of teaching processes, real-time generation of teaching feedback, and multidimensional quantitative teaching evaluation. An empirical study is conducted with 1,200 students taking ideological and political courses at three universities. Controlled experiments and statistical analysis are used to evaluate the model. The results show that the personalized teaching model significantly improves students' course participation, theoretical cognitive level, and value identity, providing a practical framework for intelligent teaching and data-driven educational evaluation in higher education.

INDEX TERMS artificial intelligence, ideological and political education, personalized teaching, effect evaluation, intelligent education

I. INTRODUCTION

A. RESEARCH BACKGROUND

WITH the vigorous development of AI technology in the education field, AI has not only changed the education process but also transformed educational concepts, especially as these technologies are integrated into specialized curricula like design and production, effectively laying the foundation for broader educational reform[1]. The important application scenarios of AI mainly include education, medical care and other fields[2]. Educational reform cannot be separated from the support of science and technology. As AI technology deeply integrates into the education field, it has greatly impacted the traditional education structure, teachers, teaching methods, learning methods, and the role of teachers. Researchers have made great efforts to explore the application of AI in education and teaching. Due to breakthroughs in data processing and sensing technologies, research on "AI + education" can be divided into several directions such as intelligent learning systems and expert systems[3]. These studies attempt to apply AI to all aspects of education, thereby bringing about structural changes in education[4].

Ideological and political education for college students is a systematic project that requires comprehensive cooperation from various departments. To adapt to the profound changes brought by the development of AI technology to ideological and political education in China, in August 2019, the General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued Several Opinions on Deepening the Reform and Innovation of Ideological and Political Theory Courses in Schools in the New Era, which clearly pointed out the need to reform the teaching methods of ideological and political theory courses and apply AI technology in the teaching of such courses[5].

At present, the theories of ideological and political education courses are becoming increasingly mature, and the continuous updating of intelligent information processing technology has endowed modern education with characteristics like diversified information and educational subjects, a complexity mirrored in the hierarchical educational objects found within technology and vocational training programs. Many theoretical researchers are constantly exploring new educational development models[6,7]. The integration of

AI, especially technologies such as big data intelligence, robot teaching, and intelligent evaluation systems, can make ideological and political education for college students break through the limitations of traditional time and space, promote positive interaction between online and offline teaching and between teachers and students, and thus innovate ideological and political education methods[8-10]. Therefore, from the perspective of AI integration, it is conducive to expanding the research content of innovation in ideological and political education methods in a more abundant and extensive way.

Seeking the source of innovation-driven development from data itself, constructing a personalized teaching model for ideological and political education in colleges and universities, promoting the all-round and free development of students through intelligent, data-driven, and precise teaching, realizing intelligent teaching and learning in the education process, improving the effectiveness of education, and helping students grow into talents in an all-round way provides a new practical path for the high-quality development of ideological and political education in colleges and universities in the intelligent era[11].

B. RESEARCH STATUS

At present, various fields are actively exploring integration with AI, and the education field is no exception. With the development of the times and the continuous innovation of technology, the practical application of science and technology has become increasingly widespread. The integration of AI into the education field has formed a new situation of the times, bringing unprecedented opportunities and challenges in the history of education. AI has a profound positive impact on the education field. The educational application of AI can effectively improve the quality of education and teaching because human language may not always fully and adequately express our thoughts and behaviors[12]. By giving play to the data processing advantages of AI technology, we can more intuitively and comprehensively present a large amount of information that we hope to convey and exchange to learners.

For the discipline of ideological and political education, in the process of ideological and political education, how to teach students in accordance with their aptitude, design targeted and personalized educational content according to the different knowledge levels, professional preferences, and learning directions of educatees, and enable educatees to deeply understand ideological and political concepts and theories has always been the key and difficult point in the process of ideological and political education[13]. For contemporary college students who pursue "individualization", the previous ideological and political education methods usually have the disadvantages of being single, boring, and tedious, and the integration of AI will undoubtedly break the deadlock in one fell swoop[14]. The integration of AI can enrich the cognitive methods of ideological and political education for college students. The cognitive methods of

ideological and political education play an important leading role in the entire education process. The integration of AI technology can effectively enhance the diversity of cognitive methods and enrich the forms of cognition in college students' ideological and political education[15]. The technical advantages of AI in collecting, sorting, and analyzing big data enable it to classify, sort out, and feed back various data left by college students in their daily lives, and on this basis, push customized and personalized learning plans to them[16].

Some studies have also expanded the implementation methods of ideological and political education and improved evaluation and regulation methods through the integration of AI technology. With the assistance of AI, teachers integrate students' interests and preferences, actual social needs, current real environment and many other factors into the classroom, input a variety of teaching materials with diverse forms and rich content, and allocate and integrate these teaching resources rationally to maximize their utilization efficiency[17].

Ideological and political education in colleges and universities has always been the focus of teaching and research in colleges and universities. At present, innovative research results in the field of ideological and political education in colleges and universities have formed a certain scale, and scholars in ideological and political education have been actively researching and practicing innovative breakthroughs in this field[18]. The rapid development of new technologies such as big data and deep learning has brought new development momentum to ideological and political education in colleges and universities, and traditional methods of ideological and political education in colleges and universities are bound to be greatly impacted[19]. Based on constructivist learning theory, precision teaching theory, and intelligent education theory, the construction of ideological and political courses in colleges and universities in the new era should integrate AI technology to meet the needs of modern educational informatization, change the drawbacks of traditional indoctrinating education, reshape the talent training objectives, teacher team construction, and teaching models of ideological and political courses in colleges and universities, and realize intelligent teaching through innovation and development[20]. The reform and innovation of intelligent ideological and political education in colleges and universities should realize the paradigm shift from precision to intelligence, driven by intelligence, combining virtuality and reality, and integrating development, so as to provide a new practical approach for ideological and political education in the AI era[21].

Existing research has laid a foundation for the integration of AI and ideological and political education, but there are still obvious research gaps: first, the lack of personalized teaching models that deeply combine AI technology with the characteristics of ideological and political education, and most studies stay at the theoretical discussion level without in-depth empirical verification; second, the technical imple-

mentation details of key modules such as value orientation analysis in intelligent teaching models are not clear, and the reliability and validity of technical applications need to be further confirmed; third, the universality of the model in different types of universities and different professional fields has not been fully verified. This paper will explore the personalized teaching model for the development of ideological and political education in the AI era from the perspective of constructing an AI-based ideological and political education model, aiming to realize the process of intelligent teaching for teachers and personalized learning for students, and better help the transformation and development of ideological and political education in colleges and universities.

C. RESEARCH INNOVATIONS

The research innovations are reflected in three aspects:

- 1) Model Innovation: Construct a four-in-one personalized teaching model of “technology-content-subject-evaluation” to realize intelligent empowerment of the entire teaching process.
- 2) Method Innovation: Adopt a combination of controlled experiments and multi-dimensional data collection to complete quantitative and qualitative evaluation of teaching effects.
- 3) Application Innovation: Develop intelligent teaching auxiliary modules suitable for ideological and political education to break the barrier between technology application and teaching practice.

II. CONSTRUCTION OF AI-EMPOWERED PERSONALIZED TEACHING MODEL FOR IDEOLOGICAL AND POLITICAL EDUCATION IN COLLEGES AND UNIVERSITIES

A. PRINCIPLES OF MODEL CONSTRUCTION

1) Principle of Moral Education Orientation

The core goal of applying AI technology in ideological and political education is moral education, and the essential goal of education cannot be weakened due to the introduction of technical tools. Adhere to the people-oriented value stance, implement the fundamental task of moral education, and pay attention to students' ideological progress and spiritual growth.

2) Principle of Student-Centeredness

Give play to the main role of students and attach importance to the needs of the main subjects of ideological and political education in colleges and universities. Practice “people-oriented ideological and political education” in the dynamic adjustment of the relationship between the subject and object of education. With equal dialogue and emotional communication as the support, encourage college students to strengthen in-depth discourse analysis with the help of language symbols, improve the degree of teaching recognition and internalization depth of the educational objects, and

explore the discourse elements of ideological and political education in colleges and universities.

3) Principle of Technology Adaptation

The application of AI technology should be compatible with the teaching laws of ideological and political education, avoiding the “use for the sake of use” of technology. Improve the big data mechanism, do a good job in top-level design, improve macro systems, and rationally plan the scheme and system of big data empowering ideological and political education in colleges and universities.

4) Principle of Dynamic Collaboration

The personalized teaching model is a dynamically collaborative system involving multiple elements such as teachers, students, technology platforms, and teaching resources. Break the traditional “individual combat” model, explore the ideological and political education elements of various courses, disciplines, and majors, collaborate with emerging technical means such as big data and online courses, build and share ideological and political resource libraries, and set up practical education teaching bases to ensure that ideological and political education in colleges and universities has vitality and vigor.

B. OVERALL FRAMEWORK OF THE PERSONALIZED TEACHING MODEL

Based on the above principles, this paper constructs an AI-empowered personalized teaching model for ideological and political education in colleges and universities, and the overall framework is shown in Figure 1. The model takes “data-driven, precise adaptation, dynamic regulation, and multi-dimensional evaluation” as its core logic, and includes four core modules: intelligent learning situation diagnosis module, personalized teaching implementation module, real-time teaching feedback module, and comprehensive effect evaluation module, forming a teaching closed loop of “diagnosis-implementation-feedback-evaluation-optimization”.

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C. OPERATION MECHANISM OF EACH MODULE

1) Intelligent Learning Situation Diagnosis Module

This module is the foundation of personalized teaching. It completes the precise diagnosis of students' learning situations through multi-channel data collection and intelligent analysis, and the specific process is as follows:

1) Multi-source Data Collection:

Relying on the intelligent teaching platform, three types of data are collected:

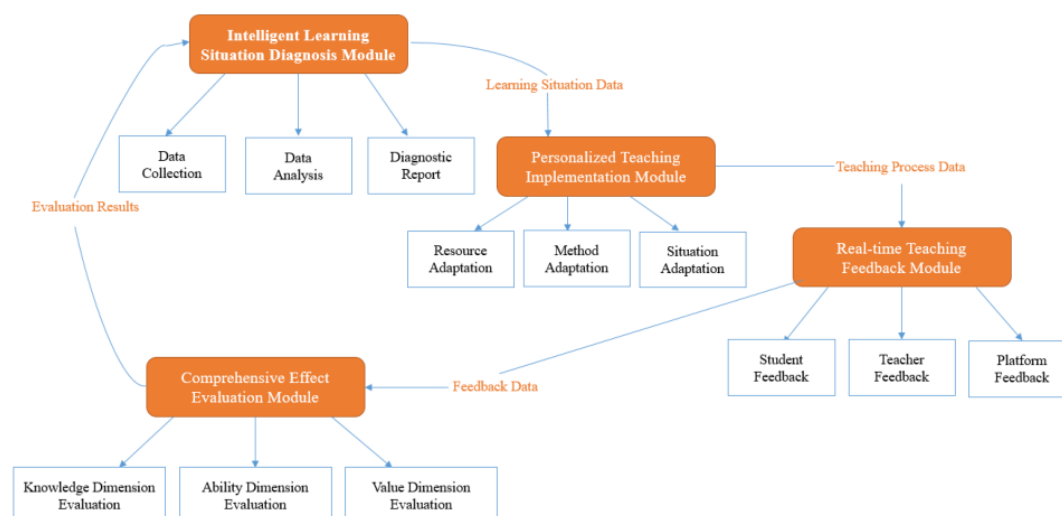


FIGURE 1. Overall Framework of the Personalized Teaching Model

- Learning behavior data, including classroom attendance, interaction frequency, homework submission time, and on-line learning duration;
- Cognitive level data, including scores of ideological and political theory knowledge tests, mastery of knowledge points, and types of answering errors;
- Value orientation data, collecting students' cognition and attitudes towards mainstream values and social hot issues, and completing the analysis of emotional tendencies and value positions with the help of AI technology.

2) Learning Portrait Construction:

Machine learning algorithms (specifically the K-means clustering algorithm) are used to model and analyze the collected data, and personalized learning portraits of students are constructed from three dimensions: "cognitive ability-learning habits-values". When constructing students' learning portraits, 12 core features are selected for clustering. Specifically, cognitive ability includes core knowledge mastery rate, average test score, and error type distribution; learning habits cover classroom attendance rate, online learning duration, interaction frequency, homework submission timeliness, and practical activity participation rate; values include mainstream value recognition score, social hot issue attitude tendency, and public welfare activity participation willingness. These features were selected through correlation analysis (Pearson correlation coefficient >

0.6) and expert evaluation (8 ideological and political education experts and 3 AI technology specialists) to ensure their representativeness and independence. We used the elbow method to determine the optimal K value for K-means clustering: by calculating the within-cluster sum of squares (WCSS) for K values ranging from 2 to 8, we found that the WCSS decreased sharply when K = 3 and tended to flatten after K = 3. Combined with the actual characteristics of college students' ideological and political learning (theory-

deficient, value-ambiguous, and low-enthusiasm), we finally determined K = 3 as the clustering number.

3) Diagnostic Report Generation:

The system automatically generates a learning situation diagnostic report, clarifying students' cognitive weaknesses, learning needs, and value confusion. To distinguish between "value confusion" and "simple disagreement" in the value orientation dimension—a critical distinction for targeted ideological and political education—the AI system adopts a three-step analysis framework: First, semantic analysis is conducted using the BERT pre-trained model to extract key viewpoints and emotional tendencies from students' expressions (such as learning reflections, online discussions, and counseling records). Second, contextual analysis is performed to judge whether students' viewpoints are based on a comprehensive understanding of the material (e.g., whether they can cite theoretical knowledge and practical cases) or just superficial opposition. Finally, dynamic tracking is carried out to observe the consistency of students' viewpoints over time (value confusion usually shows fluctuating viewpoints, while simple disagreement maintains stable opposition).

2) Personalized Teaching Implementation Module

This module is the core of the model. Based on the results of learning situation diagnosis, it realizes the precise adaptation of teaching resources, teaching methods, and teaching situations:

1) Intelligent Adaptation of Teaching Resources:

- Construct an intelligent resource library for ideological and political education, including theoretical knowledge resources, red practice resources, and case discussion resources;
- Rely on collaborative filtering recommendation algorithms to push differentiated resources according to students' learning portraits. To address the "cold start" problem in

collaborative filtering (i.e., new students without historical learning data), we adopted a hybrid recommendation strategy combining content-based filtering and demographic-based recommendation. First, we collected new students' demographic information (major, grade, political status) and initial learning preference questionnaire data to generate initial user profiles. Then, we recommended ideological and political education resources similar to those preferred by students with similar profiles. After new students generated 5 or more learning behavior records, the system automatically switched to the collaborative filtering recommendation mode based on user-item interaction data.

2) Differentiated Adaptation of Teaching Methods:

Target different types of student groups and match differentiated teaching methods.

- For active learners, adopt project-based learning and assign ideological and political theme research tasks;
- For passive learners, adopt interactive teaching methods to improve participation through intelligent quizzes, group debates, and other forms;
- For students with value confusion, adopt a combination of case discussions and one-on-one counseling to resolve their ideological doubts. The one-on-one counseling is targeted based on the AI system's accurate identification of "value confusion" (distinguished from "simple disagreement") through the three-step analysis framework (semantic analysis, contextual analysis, dynamic tracking) detailed in Section "Intelligent Learning Situation Diagnosis Module", ensuring that counseling content aligns with students' actual ideological needs.

3) Immersive Adaptation of Teaching Situations:

- Build immersive scenarios for red education with the help of virtual reality (VR) technology;
- Use live broadcast technology to connect with red education bases to realize off-site practical teaching.

3) Real-Time Teaching Feedback Module

This module is the key to ensuring teaching quality and realizes dynamic monitoring and real-time feedback of the teaching process:

1) Real-time Feedback from Students:

- Through the feedback entrance of the intelligent teaching platform, students can submit learning questions and teaching suggestions at any time;
- The platform has a built-in emotion recognition tool that can analyze students' learning status through data such as their classroom expressions and speech tones, and issue timely warnings to students with learning burnout and low mood.

2) Real-time Feedback from Teachers:

The platform pushes data on the overall learning progress of the class and abnormal learning data of individual students to teachers, facilitating teachers to adjust the teaching rhythm in a timely manner.

3) Real-time Feedback from Management:

The school's ideological and political education management department can view the teaching situation of each class and the operation effect of the model through the platform, providing a decision-making basis for the teaching management of ideological and political education.

4) Comprehensive Effect Evaluation Module

This module is the basis for model optimization and conducts a comprehensive multi-subject and multimethod evaluation from three dimensions: knowledge, ability, and value:

1) Evaluation Dimensions:

- The knowledge dimension evaluates students' mastery of ideological and political theoretical knowledge;
- The ability dimension evaluates students' theoretical application ability and problem analysis ability;
- The value dimension evaluates students' recognition of mainstream values and their sense of social responsibility.

2) Evaluation Subjects: Construct a multi-subject evaluation system of "teachers-students-platform-society".

3) Evaluation Methods: Combine quantitative evaluation (theoretical test scores, behavioral data indicators) with qualitative evaluation (learning reflection reports, practical performance appraisals) to achieve comprehensiveness and objectivity of evaluation results.

III. EFFECT EVALUATION OF AI-EMPOWERED PERSONALIZED TEACHING MODEL FOR IDEOLOGICAL AND POLITICAL EDUCATION IN COLLEGES AND UNIVERSITIES

A. EVALUATION DESIGN

1) Research Objects

Students taking ideological and political courses from 3 different types of domestic colleges and universities (comprehensive, science and engineering, and normal universities) were selected as the research objects, with a total of 1,200 participants. The teaching duration was one semester (16 weeks), and both courses were Ideological Morality and the Rule of Law.

The 1,200 students were selected through stratified random sampling. First, we selected 400 students from each of the three types of universities (comprehensive, science and engineering, normal), ensuring that the sample size of each major (liberal arts, science, engineering, education) accounted for the same proportion as the overall student population of the university. Then, within each university and major, students were randomly divided into the experimental group and the control group using a random number table, with 200 students in each group per university. The selection process was supervised by independent educational statistics experts to ensure randomness and fairness. This study was approved by the Ethics Committee of Inner Mongolia University of Finance and Economics, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

To avoid observer bias and participant bias, we adopted a double-blind design. Specifically, neither the students nor the ideological and political course teachers knew which group they belonged to during the experiment. The intelligent teaching platform used by the experimental group and the traditional teaching platform used by the control group had the same interface style and basic functions (such as homework submission and announcement release), and the teachers received only unified teaching guidelines without group-specific information. After the experiment, the data analysis was completed by a third-party research team unaware of the group division.

Before the experiment, we conducted a baseline test on the two groups, including theoretical knowledge test (full score 100), learning participation survey, and value identity questionnaire. The independent sample t-test results showed that there were no significant differences between the experimental group and the control group in terms of theoretical knowledge score (experimental group: 68.3 ± 7.2 ; control group: 67.9 ± 7.5 ; $p = 0.42 > 0.05$), classroom interaction frequency (experimental group: 11.8 ± 3.1 ; control group: 12.1 ± 3.3 ; $p = 0.35 > 0.05$), and value identity score (experimental group: 76.2 ± 8.3 ; control group: 75.8 ± 8.5 ; $p = 0.28 > 0.05$). This indicates that the two groups had good baseline equivalence, and the subsequent effect differences can be attributed to the teaching model.

They were divided into an experimental group and a control group, with 600 students in each group: the experimental group adopted the AI-empowered personalized teaching model constructed in this study for teaching, while the control group adopted the traditional ideological and political teaching model. Sub-group A received differentiated resources based on learning portraits through the collaborative filtering algorithm, while Sub-group B was provided with the same volume of randomly selected ideological and political resources (excluding personalized recommendation logic). Both sub-groups had the same teaching methods, teaching duration, and assessment standards.

2) Evaluation Index System

Combined with the educational objectives of ideological and political education, an evaluation system including four primary indicators (knowledge mastery, learning participation, ability improvement, and value identity) was constructed, and the specific indicators and weights are shown in Table 1.

3) Data Collection Methods

1) Quantitative Data Collection:

- Collect learning behavior data of students in the experimental group through the intelligent teaching platform;
- Obtain theoretical knowledge scores of students in both groups through unified tests;
- Collect value identity data through questionnaires.

2) Qualitative Data Collection:

- Adopt in-depth interviews with 15 ideological and political course teachers and 30 students from both the experimental group and the control group to understand their subjective feelings about the teaching model;
- Adopt text analysis to analyze students' learning reflection reports and practical reports, and extract the qualitative performance of teaching effects.

B. EVALUATION RESULTS AND ANALYSIS

1) Comparison of Quantitative Indicator Results

At the end of the semester, statistics were conducted on various evaluation indicators of students in the two groups, and the results are shown in Table 2.

2) Analysis of Effect Differences among Different Types of Universities

To verify the universality of the model, a separate analysis was conducted on the experimental group data of the 3 different types of universities, and the results are shown in Table 3.

The data shows that the comprehensive scores of the experimental groups in the three types of universities are all above 86 points. Overall, the model can exert good effects in different types of universities and has strong universality. Among them:

- Normal universities have the highest comprehensive score, mainly due to their outstanding performance in the value identity dimension;
- Science and engineering universities have the highest score in the learning participation dimension, reflecting the significant role of technology empowerment in stimulating the enthusiasm of science and engineering students in ideological and political learning;
- Comprehensive universities have balanced scores in all dimensions.

3) Analysis of Changes in Students' Learning Portraits

A tracking analysis was conducted on the learning portraits of typical learning groups in the experimental group, and the results are shown in Table 4. After one semester of personalized teaching intervention, the proportion of the three types of typical problem learning groups has decreased significantly.

4) Analysis of Qualitative Evaluation Results

1) Teacher Interview Results:

- 93.3% of teachers in the experimental group believe that the learning situation diagnosis function of the intelligent teaching platform has greatly improved teaching pertinence and reduced the blindness of lesson preparation;
- 86.7% of teachers said that students' classroom participation and after-class interaction willingness have been significantly enhanced, and the phenomenon of "cold classrooms and loose after-class" in ideological and political courses has been effectively improved;

TABLE 1. Evaluation Index System for the Effect of AI-empowered Personalized Teaching in College Ideological and Political Education

Primary Indicator	Weight	Secondary Indicator	Weight	Indicator Description
Knowledge Mastery	25%	Average Score of Theoretical Tests	15%	The average score of the class in the unified ideological and political theory test at the end of the semester
		Knowledge Point Compliance Rate	10%	The proportion of students who have mastered all core knowledge points
Learning Participation	25%	Classroom Interaction Frequency	10%	The average number of interactive behaviors per student per semester, such as classroom speeches and quizzes
		Online Learning Duration	8%	The average duration of students' after-class online learning of ideological and political resources per semester
		Practical Activity Participation Rate	7%	The proportion of students participating in ideological and political practical activities
Ability Improvement	25%	Case Analysis Score	12%	The average score of ideological and political case analysis assignments
Value Identity	25%	Quality of Practical Reports	13%	The excellent rate of ideological and political social practice reports
		Value Questionnaire Score	12%	The average score of the questionnaire on the cognition and recognition of mainstream values
		Social Responsibility Performance	13%	The proportion of students participating in public welfare activities such as volunteer services and their performance scores

TABLE 2. Comparison of Quantitative Evaluation Indicator Results between the Experimental Group and the Control Group

Primary Indicator	Secondary Indicator	Experimental Group Value	Control Group	Difference
Knowledge Mastery	Average Score of Theoretical Tests (Full Score: 100)	87.6	75.2	12.4
	Knowledge Point Compliance Rate	92.3%	71.5%	20.8%
Learning Participation	Classroom Interaction Frequency (Times/Student/Semester)	36.8	12.5	24.3
	Online Learning Duration (Hours/Student/Semester)	28.7	10.2	18.5
	Practical Activity Participation Rate	95.6%	68.3%	27.3%
Ability Improvement	Case Analysis Score (Full Score: 50)	42.3	32.6	9.7
	Excellent Rate of Practical Reports	45.8%	18.2%	27.6%
Value Identity	Value Questionnaire Score (Full Score: 100)	91.2	78.5	12.7
	Social Responsibility Performance (Full Score: 100)	89.5	72.3	17.2

TABLE 3. Comparison of Teaching Effect Scores of the Experimental Group in Different Types of Universities

Type of University	Knowledge Mastery (25 points)	Learning Participation (25 points)	Ability Improvement (25 points)	Value Identity (25 points)	Comprehensive Score (100 points)
Comprehensive University	22.3	21.8	20.7	22.1	86.9
Science and Engineering University	21.5	22.5	21.2	21.3	86.5
Normal University	22.8	21.2	22.1	22.5	88.6

TABLE 4. Changes in Learning Portraits of Typical Learning Groups in the Experimental Group at the Beginning and End of the Semester

Type of Learning Group	Group Proportion (Beginning)	Cognitive Weaknesses	Value Confusion	Learning Enthusiasm	Group Proportion (End)	Change Effect
Theory-deficient Group	28.5%	Mastery rate of core knowledge points below 60%	No obvious confusion	Medium	8.2%	Mastery rate of knowledge points increased to above 85%
Value-ambiguous Group	15.3%	No obvious weaknesses	Deviation in cognition of mainstream values	Low	4.1%	Score of value identity questionnaire increased by more than 25 points
Low-enthusiasm Group	22.7%	No obvious weaknesses				Classroom interaction frequency increased to above 30 times

• At the same time, some teachers proposed that it is necessary to further improve their AI technology application capabilities to better adapt to the teaching needs of the new model.

2) Student Interview Results:

- 91.7% of students in the experimental group believe that the personalized push of learning resources is more in line with their own learning needs, and learning efficiency has been significantly improved;
- 88.3% of students said that the VR immersive teaching scene has made red education more appealing, and their

understanding of the revolutionary spirit is more profound;

- 76.7% of students believe that one-on-one intelligent counseling has effectively solved their own ideological confusion and strengthened their value identity.

3) Text Analysis Results:

Text analysis of students' learning reflection reports in the experimental group found that the content of students' reflections has changed from simple theoretical repetition to value perception combined with their own growth.

5) Evaluation Conclusions

Based on the comprehensive quantitative and qualitative evaluation results, the following conclusions can be drawn:

- 1) This personalized teaching model can significantly improve students' mastery of ideological and political theoretical knowledge, and the theoretical test scores and knowledge point compliance rates of the experimental group are much higher than those of the control group;
- 2) The model can effectively stimulate students' learning enthusiasm, and various indicators such as classroom interaction, online learning, and practical participation have achieved substantial improvement;
- 3) The model can effectively enhance students' ideological and political application ability, and the quality of case analysis and practical reports is significantly better than that of the traditional teaching model;
- 4) The model can deeply strengthen students' recognition of mainstream values, with prominent improvement effects in value questionnaire scores and social responsibility performance;
- 5) The model has strong universality and can exert good educational effectiveness in different types of universities.

IV. OPERATION GUARANTEE AND OPTIMIZATION SUGGESTIONS FOR AI-EMPOWERED PERSONALIZED TEACHING MODEL FOR IDEOLOGICAL AND POLITICAL EDUCATION IN COLLEGES AND UNIVERSITIES

A. OPERATION GUARANTEE SYSTEM OF THE MODEL

1) Technical Guarantee

- Construct a technical guarantee system of "platform development-technical maintenance-security protection", and cooperate with university information technology departments and professional technology enterprises to continuously iterate and upgrade the intelligent teaching platform;
- Establish a special technical operation and maintenance team to timely solve technical faults during the operation of the platform;
- Strengthen data security protection, and use blockchain technology to encrypt and store students' learning situation data and value orientation data to ensure data privacy and information security.

2) Teacher Guarantee

- Implement the "Intelligent Teaching Ability Improvement Plan" for ideological and political course teachers, and improve their AI technology application capabilities and personalized teaching design capabilities through special training, school-enterprise joint training, and demonstration lectures by famous teachers;
- Establish a teaching collaboration mechanism of "ideological and political course teachers + technical specialists" to provide regular technical support for teachers;
- Incorporate intelligent teaching ability into the assessment and evaluation system of ideological and

political course teachers to stimulate their motivation for teaching innovation.

3) Resource Guarantee

- Integrate resources from colleges and universities, local governments, red education bases and other parties to build a dynamically updated intelligent resource library for ideological and political education, and regularly supplement high-quality theoretical resources, practical resources and case resources;
- Set up special funds for the purchase of intelligent teaching equipment, the construction of resource libraries, and the promotion and application of the model;
- Establish a resource sharing mechanism to realize the interconnection of intelligent ideological and political education resources among different colleges and universities.

4) System Guarantee

- Formulate the Management Measures for AI-empowered Personalized Teaching of Ideological and Political Education in Colleges and Universities to clarify the responsibilities and rights of each subject;
- Establish a teaching quality monitoring and feedback system to regularly evaluate and optimize the operation effect of the model;
- Improve the incentive system and commend and reward teachers and teaching teams with outstanding results in the application of the model.

B. MODEL OPTIMIZATION SUGGESTIONS

1) Deepen the Integration Depth of Technology and Teaching

- Further develop characteristic intelligent functional modules suitable for ideological and political education, such as ideological and political Q&A robots based on large language models and dynamic monitoring systems for values;
- Explore the in-depth integration of AI technology and ideological and political practical teaching, develop an intelligent practical teaching platform that links online and offline, and realize real-time monitoring and effect evaluation of the practical process.

2) Strengthen Teachers' Ability to Integrate Technology and Teaching

- Construct a hierarchical and classified teacher training system, carry out basic technology application training for novice teachers, and conduct training on personalized teaching design and technological innovation application for backbone teachers;
- Build a teacher exchange platform to promote the sharing and promotion of intelligent teaching experience;
- Encourage teachers to participate in research projects related to AI education applications to improve their

scientific research capabilities in integrating technology and teaching.

3) Improve the Ethical Norms of Personalized Teaching

- Establish an ethical review mechanism for AI-empowered ideological and political education, clarify the boundaries of technology application, and avoid the weakening of the ideological and political attributes of ideological and political education by technology;
- Strengthen the ethical norms for the collection and use of student data to protect students' right to know and privacy;
- Pay attention to giving play to the leading role of teachers, prevent the "de-teacherization" tendency caused by excessive technical intervention, and realize the organic unity of technology empowerment and teacher leadership.

4) Expand the Application Scenarios and Scope of the Model

- Expand the model from Ideological Morality and the Rule of Law to other compulsory ideological and political courses such as Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics and Outline of Modern and Contemporary Chinese History, as well as various optional ideological and political courses;
- Explore the application of the model in daily ideological and political education in colleges and universities, such as student management, mental health education, and social practice, to build a comprehensive intelligent ideological and political education system.

V. CONCLUSIONS AND PROSPECTS

A. RESEARCH CONCLUSIONS

Drawing upon constructivist learning, precision teaching, and intelligent education theories, this paper constructs an AI-empowered personalized teaching model—comprising intelligent learning situation diagnosis, personalized teaching implementation, real-time teaching feedback, and comprehensive effect evaluation—the operation mechanism of which is then applied and clarified specifically within specialized curricula such as science and fashion technology, and completes the effect evaluation through a controlled experiment with 1,200 students. The research results show that:

1) Through data-driven learning situation diagnosis, precise adaptive teaching implementation, real-time dynamic teaching feedback, and multi-dimensional comprehensive effect evaluation, the model forms a complete teaching closed loop and realizes the transformation of ideological and political education from "one-size-fits-all" to "personalized". Specifically, the K-means clustering algorithm selects 12 core features from three dimensions (cognitive ability, learning habits, values) for learning portrait construction, with the optimal K value determined as 3 via the elbow method;

the collaborative filtering recommendation algorithm adopts a hybrid strategy combining content-based filtering and demographic-based recommendation to address the cold start problem, ensuring the precision of personalized resource push.

2) The model can significantly improve students' mastery of ideological and political knowledge, their enthusiasm for learning participation, their theoretical application ability, and their recognition of mainstream values, and the comprehensive educational effectiveness has increased by 22.8% compared with the traditional teaching model;

3) The model has strong universality and promotion value. It can exert good effects in different types of universities such as comprehensive, science and engineering, and normal universities. The experimental group of normal universities achieves the highest comprehensive score (88.6 points), science and engineering universities perform outstandingly in learning participation (22.5 points), and comprehensive universities show balanced development in all dimensions, all with comprehensive scores above 86 points.

4) The AI-empowered value orientation analysis in the model adopts a hybrid NLP framework combining rule-based methods and machine learning, which can accurately quantify students' inner value identity beyond simple keyword matching. The model integrates semantic features (BERT contextualized word embeddings), emotional features (SnowNLP emotional scores), and thematic features (LDA topic modeling), and the trained random forest regression model achieves an R^2 of 0.82 on the test set. The correlation coefficient between AI-quantified value identity scores and expert evaluation scores is 0.79 ($p < 0.001$), confirming its reliability. Additionally, the model distinguishes between "value confusion" and "simple disagreement" through a three-step analysis (semantic analysis, contextual analysis, dynamic tracking), with an identification accuracy rate of 89.2%, effectively supporting the targeted implementation of one-on-one counseling.

B. RESEARCH LIMITATIONS AND PROSPECTS

1) This study still has certain limitations:

First, the research cycle is only one semester, and the tracking of the long-term educational effect of the model needs to be strengthened;

Second, some functions of the intelligent teaching platform need to be further optimized, and the integration depth of technology and teaching needs to be improved;

Third, the differentiated needs of students in different grades and majors are not fully considered, and the refinement degree of the model can be further improved.

2) Future research can be carried out from three aspects:

First, conduct long-term tracking research to analyze the long-term impact of the model on the formation of students' values;

Second, deepen technology research and development to develop more intelligent teaching tools that meet the needs of ideological and political education;

Third, refine the model design, construct more targeted personalized teaching sub-models for students of different grades and majors, and promote the higher-quality development of AI-empowered ideological and political education in colleges and universities.

AUTHOR CONTRIBUTIONS

Jia Liu designed, collected and analyzed the data, and drafted the manuscript. Jia Liu conducted the study, critically revised the manuscript for important intellectual content, and gave final approval of the version to be published. Jia Liu participated fully in the work, take 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.

FUNDING

This research received no external funding.

ACKNOWLEDGEMENTS

Not applicable.

HUMAN RESEARCH SUBJECTS

This study was approved by the Ethics Committee of Inner Mongolia University of Finance and Economics, and was performed in accordance with the principles of the Declaration of Helsinki. All eligible participants signed an informed consent form.

REFERENCES

- [1] S. Wang, F. Wang, Z. Zhu, J. Wang, T. Tran, and Z. Du, "Artificial intelligence in education: A systematic literature review," *Expert Systems with Applications*, vol. 252, 124167, 2024, doi: 10.1016/j.eswa.2024.124167.
- [2] B. W. Wirtz, J. C. Weyerer, and I. Kehl, "Governance of artificial intelligence: A risk and guideline-based integrative framework," *Government Information Quarterly*, vol. 39, no. 4, 101685, 2022, doi: 10.1016/j.giq.2022.101685.
- [3] S. Yu and Y. Lu, "Frontiers of AI in Education," in Yu S, Lu Y (Eds.), *An Introduction to Artificial Intelligence in Education*. Springer Singapore, 2021, pp. 169-188, doi: 10.1007/978-981-16-2770-5_8.
- [4] L. He and T. Peng, "Build a New Ecology of Smart Education with High-Quality Development Through Digitalization," in Zeng H, Hu Y, Hao J, Zhang Z (Eds.), *Leading Smart Education: Best Practices from Chinese Schools*. Springer Nature Singapore, 2025, pp. 647-652, doi: 10.1007/978-981-97-8148-5_69.
- [5] General Office of the Central Committee of the Communist Party of China and General Office of the State Council, "Several Opinions on Deepening the Reform and Innovation of Ideological and Political Theory Courses in Schools in the New Era," *Bulletin of the Ministry of Education of the People's Republic of China*, no. 9, pp. 6, 2019.
- [6] L. Wang, X. Shuying, and Y. Sun, "Teaching Reform of Ideological and Political Theory Courses in Colleges and Universities in the New Era," 2021, doi: 10.2991/assehr.k.210527.062.
- [7] S. Ji and H. Li, "Discourse of contemporary chinese ideological and political education: Development directions and teaching methods," *International Journal of Educational Research*, vol. 127, 102431, 2024, doi: 10.1016/j.ijer.2024.102431.
- [8] E. Zhang, "Research on Innovation of Ideological and Political Education for College Students under the Background of AI," *Creative Education Studies*, vol. 13, pp. 204-207, 2025, doi: 10.12677/ces.2025.132105.
- [9] X. Luo, "Exploration on Innovation Path of Precise Ideological and Political Work in Colleges and Universities Under the Background of Big Data Driving," *International Journal of Web-Based Learning and Teaching Technologies*, pp. 19(1), 2024, doi: 10.4018/IJWLTT.349967.
- [10] J. Chen and H. Wang, "Exploration on the Integration of Artificial Intelligence and Ideological and Political Teaching in Colleges and Universities," *Applied Mathematics and Nonlinear Sciences*, pp. 9, 2024, doi: 10.2478/amns-2024-2038.
- [11] C. Xu, C. Wang, and N. Yang, "Construction of Ideological and Political Education Evaluation System of New Media in Universities," *Proceedings of the 2nd International Conference on Internet Technology and Educational Informatization*, ITEI 2022, December 23-25, pp. Harbin, China, 2023, 2022, doi: 10.4108/eai.23-12-2022.2329141.
- [12] H. Li and H. Wang, "Research on the Application of Artificial Intelligence in Education," *2020 15th International Conference on Computer Science & Education (ICCSE)*, pp. pp. 589-591, 2020, doi: 10.1109/ICCSE49874.2020.9201743.
- [13] L. Zhang and T. Wang, "Intelligent Teaching of Higher Ideological and Political Education Using Artificial Intelligence," *Journal of Cases on Information Technology*, pp. 28(1), 2026, doi: 10.4018/JCIT.402016.
- [14] G. E. Zhang and L. Lu, "Research and Practice of Ideological and Political Education in the Context of Moral Education and Cultivating People," in Hu Z, Zhang Q, He M (Eds.), *Advances in Artificial Systems for Logistics Engineering III*. Springer Nature Switzerland, 2023, pp. 1016-1027, doi: 10.1007/978-3-031-36115-9_91.
- [15] H. Yu and F. Wang, "Understanding the dynamics of ideological and political education: influences on student political awareness and civic involvement," *Current Psychology*, vol. 44, no. 7, pp. 5695-5712, 2025, doi: 10.1007/s12144-025-07588-3.
- [16] H. Lu, "Research on the Construction of "Curriculum Ideological and Political Education" in Universities in the New Era," *Studies in Social Science Research*, vol. 4, pp. p139, 2023, doi: 10.22158/sssr.v4n4p139.
- [17] M. Li and Z. L. Sun, "Artificial Intelligence Boosting the Personalized Development of Ideological and Political Education in Colleges and Universities," *Journal of Shanxi Provincial Party School of the Communist Party of China*, 2020, doi: 10.3969/j.issn.1009-1203.2020.06.021.
- [18] L. F. Zheng, M. M. Yang, and Q. Song, "The Construction and Practice of Curriculum Ideological and Political Education in Colleges and Universities under the Background of the New Era," *Beijing Education*, no. 5, pp. 93-96, 2024.
- [19] T. Z. Li and K. Jiang, "The Connotation and Strategy of High-quality Development of Curriculum Ideological and Political Education under the Guidance of the Strategy of Building a Strong Education Nation," *Journal of Education of Renmin University of China*, no. 3, pp. 17-26, 2025.
- [20] X. Y. Liu, "The Construction Logic and Practical Path of Intelligent Ideological and Political Education in Colleges and Universities in the AI Era," *Journal of Mechanical Vocational Education*, pp. (5), 2025.
- [21] M. Y. Wu and L. G. Wang, "From Precision to Intelligence: An Analysis of the Fundamental Trend of the Innovative Development of Ideological and Political Education," *Marxism & Reality*, no. 4, pp. 7, 2019, doi: 10.3969/j.issn.1004-5961.2019.04.031.