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Research on the Reconstruction of the Teaching Model for University Ideological and Political Theory Courses from the Perspective of Human-Computer Collaboration

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Abstract

With the rapid development of generative artificial intelligence technology, the traditional teaching model for university ideological and political theory courses is facing a profound transformation. This study, based on human-computer collaboration theory and constructivist learning theory, and through in-depth investigation of teaching practices in universities such as Zhejiang University, constructs a teaching model for ideological and political courses that integrates digital human lecturing, AI-assisted learning, human-computer co-creation, and intelligent assessment. The study adopts a mixed-methods research approach to analyze the teaching experiment data of more than 5,000 students. The results show that this model can significantly increase student classroom participation by 30-50%, and 85% of students indicated that their learning interest was significantly enhanced. The study finds that the human-computer collaborative teaching model, through a deep integration of technological empowerment and value inheritance, effectively solves the problems existing in traditional ideological and political course teaching, such as theoretical abstraction, low participation, and insufficient personalization. However, the promotion and application of the model still face challenges such as technological maturity, faculty competence, and ethical risks, which need to be addressed through systematic policy support, capacity building, and collaborative innovation.

Keywords: Human-Computer Collaboration, Ideological and Political Theory Course, Teaching Model Reconstruction, Generative Artificial Intelligence, Digital Human Lecturing

1. Introduction

Since entering the new era, university ideological and political theory courses have shouldered the important mission of cultivating builders and successors of socialism[1,2]. The ideological and political course is the key course for implementing the fundamental task of fostering virtue through education[3]. However, the teaching of ideological and political courses still faces numerous challenges. The traditional one-way lecture model struggles to stimulate the learning interest of "post-00s" university students, a distance exists between abstract theoretical knowledge and students' real-life experiences, and the contradiction between the demand for personalized teaching and the supply of standardized teaching is increasingly prominent.

The breakthrough development of generative artificial intelligence technology provides new possibilities for solving these problems. Technologies represented by ChatGPT and Sora not only possess powerful content generation capabilities but can also achieve personalized recommendations and intelligent interaction, providing a technical foundation for reconstructing the teaching model of ideological and political courses. More importantly, the application of these technologies is not merely a simple tool replacement but has given rise to a new teaching paradigm: human-computer collaboration. In this paradigm, the emotional intelligence of human teachers and the cognitive intelligence of artificial intelligence are mutually integrated, forming a teaching innovation that transcends the mere application of technology.

Currently, the academic community has paid considerable attention to the application of artificial intelligence in education, but systematic research specifically on the reconstruction of the teaching model for ideological and political courses is relatively insufficient. Existing research mostly remains at the superficial analysis of technological applications, lacking in-depth exploration of the internal mechanisms of human-computer collaboration and also lacking empirical validation based on large-scale practice. This study attempts to fill this

gap by constructing a systematic theoretical framework and conducting in-depth empirical analysis to provide theoretical guidance and practical reference for the reform of ideological and political course teaching in the new era.

2. Literature Review and Theoretical Basis

The theoretical origins of human-computer collaborative teaching can be traced back to the concept of "man-computer symbiosis" proposed by Licklider in the 1960s[4]. This concept emphasizes that humans and machines should form a close cooperative relationship to maximize overall effectiveness by leveraging their respective strengths. With the development of artificial intelligence technology, this idea was gradually introduced into the field of education and has gained realistic technical support in recent years with breakthroughs in deep learning, natural language processing, and other technologies.

The research of foreign scholars on human-computer collaborative teaching has mainly focused on technological applications and effect evaluation[7]. Popenici and Kerr, through a systematic analysis of AI applications in higher education, proposed a student-centered human-computer collaborative learning framework, emphasizing that technology should serve the personalized development needs of students rather than replacing the core functions of teachers[5]. Holmes et al. further analyzed the application scenarios of artificial intelligence in education, believing that the core of human-computer collaborative teaching lies in achieving an organic combination of the emotional intelligence of human teachers and the cognitive intelligence of artificial intelligence[6]. These studies provide important perspectives for understanding the essential characteristics of human-computer collaborative teaching.

Domestic scholars' attention to this field started later but has developed rapidly. Zhang Yi et al., through an empirical study on the learning engagement of university students in a smart classroom environment, found that technology-supported personalized learning can significantly enhance students' participation and learning outcomes[8]. Huang Ronghuai et al. analyzed the development trend of human-computer collaborative teaching from the macro perspective of educational informatization, believing that this model will become an important form of future education[9]. However, these studies mainly focus on the application effects at the technical level and lack sufficient attention to the deep mechanisms of teaching model reconstruction.

In terms of innovating the teaching of ideological and political courses, scholars have conducted multi-angle explorations in recent years[12]. Gao Jiajun, from the perspective of media convergence, discussed the application of short video technology in ideological and political education, proposing a theoretical framework for empowering ideological and political education with mainstream short videos[10]. Xu Gang et al. analyzed the role mechanism of online short videos in ideological and political education, pointing out the existing problems and coping strategies in technology application[11]. Zhang Lei, from the perspective of digital and intelligent development, studied the reform trends of ideological and political education, emphasizing the important role of features like virtual-real interaction and immersive symbiosis[13]. These studies provide important theoretical references for this paper, but most remain at the analysis of the application of single technological tools, lacking systematic model construction.

Based on the review and analysis of existing research, this study believes that the construction of a human-computer collaborative teaching model for ideological and political courses needs to address three key issues. The first is the theoretical foundation issue, that is, how to build a systematic theoretical framework based on the intersection of multiple disciplines such as education, psychology, and technology science. The second is the model design issue, that is, how to transform abstract theories into concrete and operable teaching models. The third is the practical validation issue, that is, how to verify the effectiveness and feasibility of the model through scientific empirical research.

From a theoretical foundation perspective, human-computer collaboration theory provides the core analytical framework for this study. This theory emphasizes that humans and machines each have their own advantages, and through synergistic cooperation, the optimization of the overall effect can be achieved. In the field of education, human teachers are skilled in emotional communication, value guidance, innovative thinking, etc., while artificial intelligence technology is skilled in information processing, personalized recommendations, repetitive tasks, etc. The organic combination of the two can create teaching effects that surpass their individual limitations.

Constructivist learning theory provides important guidance for the instructional design of this study[14]. This theory holds that learning is a process in which learners actively construct knowledge, emphasizing the important role of the learning environment, social interaction, and individual experience in knowledge construction. In the human-computer collaborative teaching model, artificial intelligence technology provides learners with rich

learning resources and personalized support, while human teachers guide learners to conduct in-depth thinking and value construction, both of which jointly create a learning environment conducive to knowledge construction.

The Technology Acceptance Model provides a theoretical tool for understanding user acceptance of new technologies. This model holds that a user's acceptance of a technology is mainly influenced by two factors: perceived usefulness and perceived ease of use[15]. In the design and promotion of the human-computer collaborative teaching model, the acceptance of the technology by teachers and students must be fully considered, and the success of the model's implementation can be promoted by enhancing the technology's practicality and ease of use.

3. Theoretical Construction of the Human-Computer Collaborative Ideological and Political Course Teaching Model

The human-computer collaborative teaching model for ideological and political courses is essentially a new type of teaching organization form, characterized by the deep integration of technology and education, with the goal of enhancing teaching effectiveness and learning experience. The theoretical connotation of this model can be understood from multiple levels.

From a systems theory perspective, the human-computer collaborative teaching model is a complex system containing a technology subsystem, an education subsystem, and a social subsystem. The technology subsystem provides powerful tool support for teaching, the education subsystem carries the core functions of knowledge transmission and value guidance, and the social subsystem provides institutional guarantees and environmental support. The three subsystems interact and influence each other, jointly forming a complete teaching ecosystem.

From the perspective of synergetics, the human-computer collaborative teaching model embodies the principle of order parameters and synergistic effects. In this model, the human teacher and artificial intelligence technology, as two main order parameters, drive the entire teaching system to a higher level of development through synergistic action. When the synergy between the two reaches an optimal state, a synergistic effect that exceeds the sum of their individual capabilities will be produced. From an educational perspective, the human-computer collaborative teaching model embodies the educational concepts of teaching students according to their aptitude and comprehensive development. Through the personalized recommendations and intelligent analysis of artificial intelligence technology, each student can receive learning support suitable for their own characteristics and needs. At the same time, the value guidance and emotional care of human teachers ensure the all-round development of students.

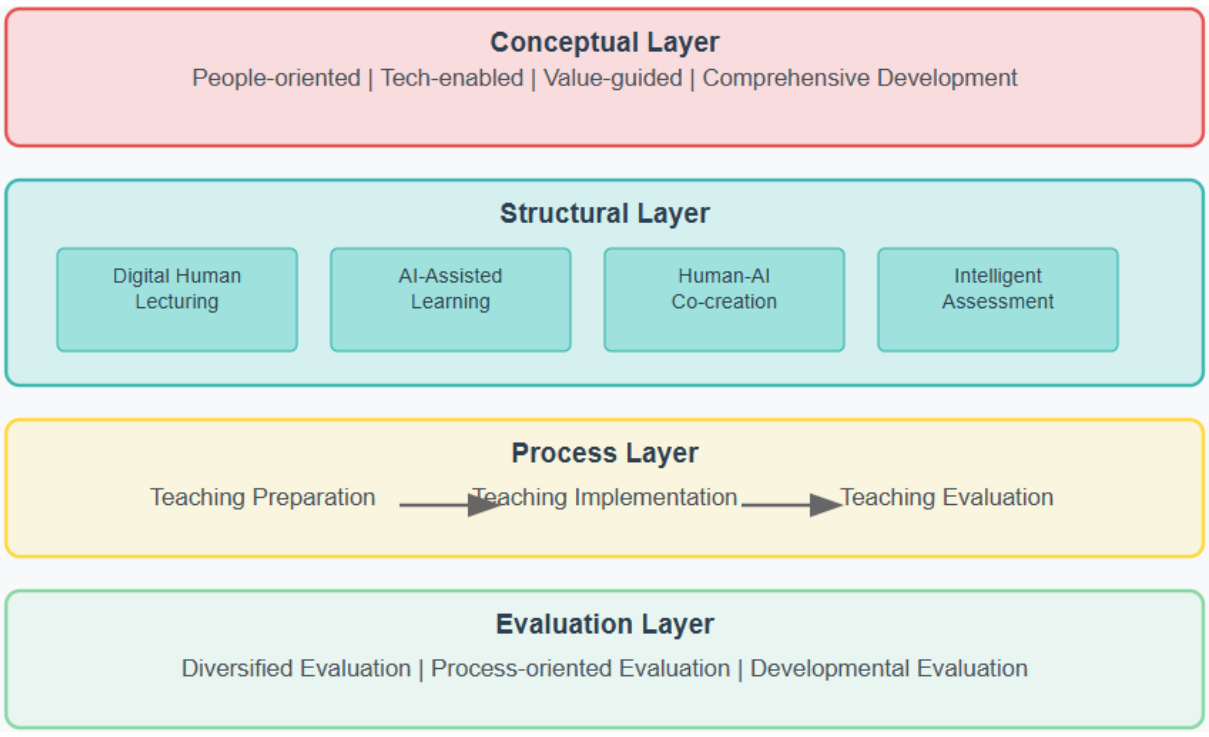

Figure 1. Theoretical Framework of Human-Computer Collaborative Ideological and Political Course Teaching Model

Based on these theoretical understandings, this study constructs a four-layer theoretical framework for the human-computer collaborative teaching model for ideological and political courses. The conceptual layer is the value core of the entire model, reflecting the people-oriented educational philosophy, the instrumental rationality of technological empowerment, the essential requirement of value guidance, and the goal of comprehensive development. The structural layer is the organizational architecture of the model, including four core modules: digital human lecturing, AI-assisted learning, human-computer co-creation, and intelligent assessment. The process layer is the operational mechanism of the model, covering three main stages: teaching preparation, teaching implementation, and teaching evaluation. The evaluation layer is the quality assurance of the model, ensuring teaching effectiveness through diversified evaluation methods.As shown in Figure 1, this framework presents characteristics of clear hierarchy and complete elements.

The innovation of this theoretical framework lies in its breakthrough of the limitations of traditional teaching models by incorporating technological factors as endogenous variables into the teaching system, achieving an organic unity of technological logic and educational logic. At the same time, the framework emphasizes the subjective status of humans, avoiding the tendency of technological determinism and reflecting humanistic care and value rationality.

4. Teaching Model Design and Architecture

Based on the aforementioned theoretical framework, this study designed a human-computer collaborative teaching model for ideological and political courses characterized by a "four-in-one" structure. This model achieves a deep integration of technology and education through the organic integration of four modules: digital human lecturing, AI-assisted learning, human-computer co-creation, and intelligent assessment, as illustrated in Figure 2.

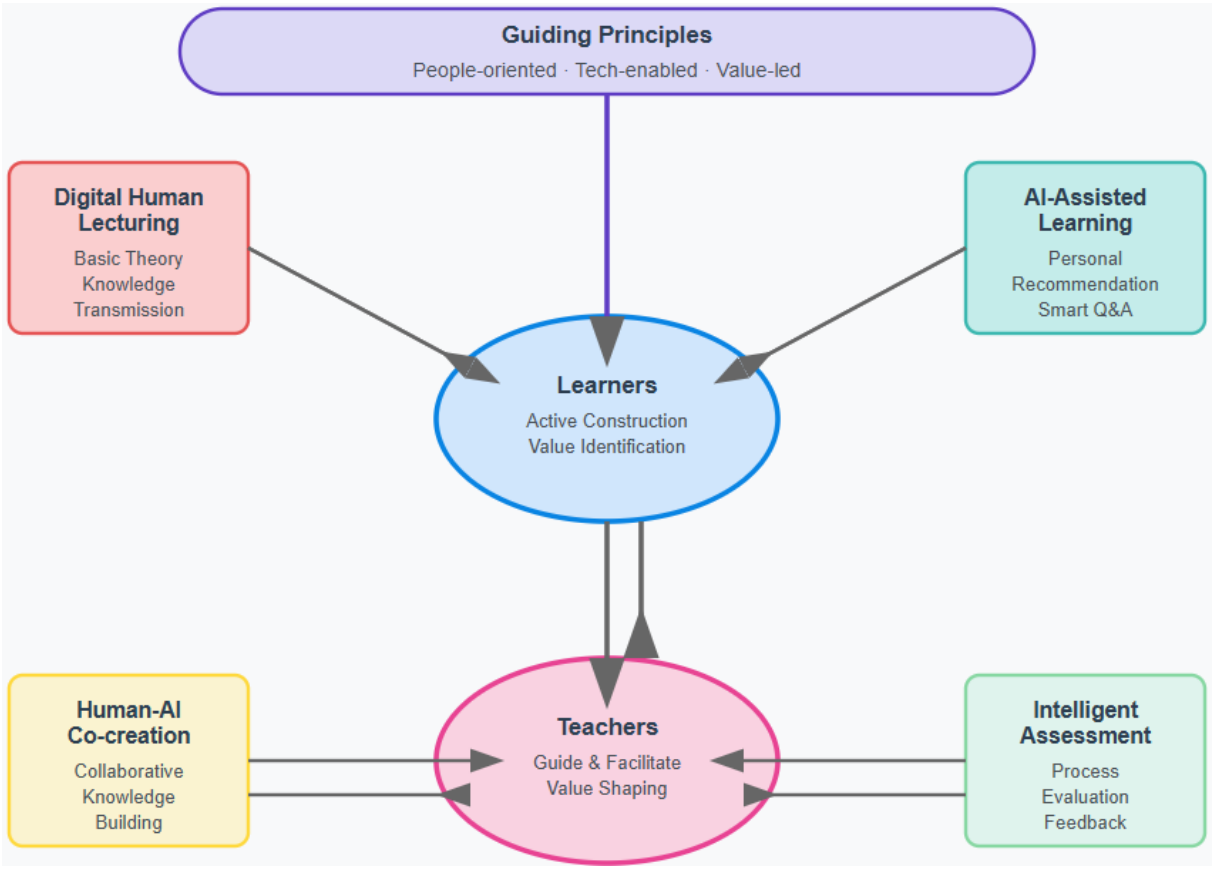

Figure 2. Architecture of Human-Computer Collaborative Ideological and Political Course Teaching Model

The digital human lecturing module undertakes the function of imparting basic theoretical knowledge. Through generative artificial intelligence technology, the system can create virtual teacher images with a sense of realism and affinity. These digital human teachers not only possess a realistic appearance and natural speech but can also make real-time adjustments based on teaching content and student feedback. Unlike traditional video teaching, digital human lecturing is highly interactive and adaptive, capable of providing personalized teaching services for

different students[16]. In terms of specific implementation, the digital human lecturing module integrates multiple technologies such as natural language processing, computer vision, and speech synthesis. The system first builds a digital human model based on the image and teaching style of a real teacher, and then endows the digital human with intelligent teaching capabilities through deep learning technology. The digital human teacher can systematically explain core content such as the basic principles of Marxism and the theoretical system of socialism with Chinese characteristics according to the requirements of the teaching syllabus, while also providing vivid and specific case analyses by combining current events and social realities.

The AI-assisted learning module provides students with all-round personalized learning support. This module, through big data analysis and machine learning technology, can understand students' learning status, cognitive levels, and personalized needs in real-time, and provide precise learning resource recommendations and learning path planning accordingly. This personalized support is not only reflected in the pushing of learning content, but also in the recommendation of learning methods, adjustment of learning progress, and feedback on learning effects, among other aspects[17]. The core technology of this module is a learning analysis system based on deep learning. By collecting and analyzing students' learning behavior data, the system builds personalized student profiles and designs the most suitable learning plan for each student based on these profiles. At the same time, the system also provides a 24-hour intelligent Q&A service, offering timely and accurate answers when students encounter problems.

The human-computer co-creation module is the innovative highlight of the entire teaching model. In this module, teachers and students jointly participate in the creation of teaching content and the construction of knowledge. Artificial intelligence technology provides help in aspects such as material collection, content generation, and technical support for creation, while human teachers are responsible for creative guidance, value leadership, and quality control. In this process, students are not only receivers of knowledge but also creators and disseminators of knowledge. Human-computer co-creation activities are usually carried out around social hot topics with contemporary characteristics and educational significance. For example, discussing technological ethics issues around the development of artificial intelligence technology, or exploring the responsibility of youth around the phenomenon of "brittle university students." Under the guidance of teachers and the support of AI technology, students complete various forms of creative tasks through group collaboration, including poems, songs, videos, and scripts. This creative activity not only enhances students' participation and innovation capabilities but also deepens their understanding and identification with the teaching content of the ideological and political course.

The intelligent assessment module achieves a comprehensive, objective, and dynamic evaluation of the learning process and learning outcomes. This module abandons the traditional singular and summative assessment methods, adopting a diversified, process-oriented, and developmental assessment philosophy. The assessment content not only includes knowledge mastery but also multiple dimensions such as skill development and value identification level. In terms of technical implementation, the intelligent assessment module utilizes technologies such as natural language processing, learning analytics, and affective computing. The system can automatically analyze students' homework, discussion contributions, creative works, etc., to extract valuable assessment information. At the same time, by monitoring students' learning behavior in real-time, the system can promptly identify problems in learning and provide targeted improvement suggestions.

The four modules are not in a simple parallel relationship but are an interconnected and mutually supportive organic whole. Digital human lecturing provides students with basic theoretical learning, AI-assisted learning provides personalized support for different students, human-computer co-creation allows students to deepen their understanding in practice, and intelligent assessment provides scientific feedback and guidance for the entire learning process. Through the synergistic effect of the four modules, the entire teaching model achieves a fundamental shift from knowledge transmission to ability cultivation, from uniform requirements to personalized development, and from passive learning to active construction.

5. Practical Exploration and Empirical Analysis at Zhejiang University

Zhejiang University, as a nationally renowned comprehensive research university, has a profound technical accumulation and innovative tradition in educational informatization and artificial intelligence applications. In 2024, the university's School of Marxism launched the "AI + Ideology, Morality, and Law" teaching reform project, which became the first large-scale practice of applying generative artificial intelligence technology to the teaching reform of ideological and political courses in China[19].

The implementation of the project reflected systematic and gradual characteristics. In the preparation stage, the university formed an interdisciplinary team composed of experts in Marxist theory, educational technology, and artificial intelligence to jointly develop the teaching system and design the teaching plan. The technical team was

responsible for building the AI teaching platform, education experts were responsible for designing the teaching content and evaluation system, and Marxist theory experts were responsible for ensuring the political direction and value orientation of the teaching.

In the implementation stage, the project was fully rolled out to more than 5,000 students across the university. Digital human teachers undertook the task of explaining most of the basic theoretical knowledge, conducting systematic teaching on cutting-edge topics such as "The Ethics and Law of Generative Artificial Intelligence" and "The Responsibilities of Youth in the New Era." The AI-assisted learning system provided personalized learning resource recommendations and learning guidance based on each student's learning characteristics and needs. Teachers and students jointly carried out creative activities on multiple themes, producing works of diverse forms and rich content.

To scientifically evaluate the effects of the teaching reform, the research team adopted a rigorous experimental design. Students participating in the reform were designated as the experimental group, while students with similar conditions who did not participate in the reform were selected as the control group, and the teaching effects of the new model were assessed through comparative analysis. At the same time, the study also adopted multiple data collection methods, including questionnaires, interviews, classroom observations, and analysis of works, to ensure the reliability and validity of the research results.

5.1 Quantitative Effect Analysis

Quantitative analysis results showed that the human-computer collaborative teaching model achieved significant effect improvement in multiple dimensions. In terms of classroom participation, the average participation rate of the experimental group reached 70.2%, while that of the control group was only 45.8%, an increase of 53.3%[19]. This result indicates that the new teaching model can effectively stimulate students' learning interest and participation enthusiasm.

In terms of learning outcomes, the average score of the experimental group in the final exam was 85.6, while the control group's was 78.4, an improvement of 9.2%[19]. More importantly, the experimental group students performed significantly better than the control group in higher-order thinking skills such as critical thinking and innovation.

As shown in Figure 3, the comparative analysis between the experimental group and control group clearly demonstrates the significant advantages of the human-computer collaborative teaching model.

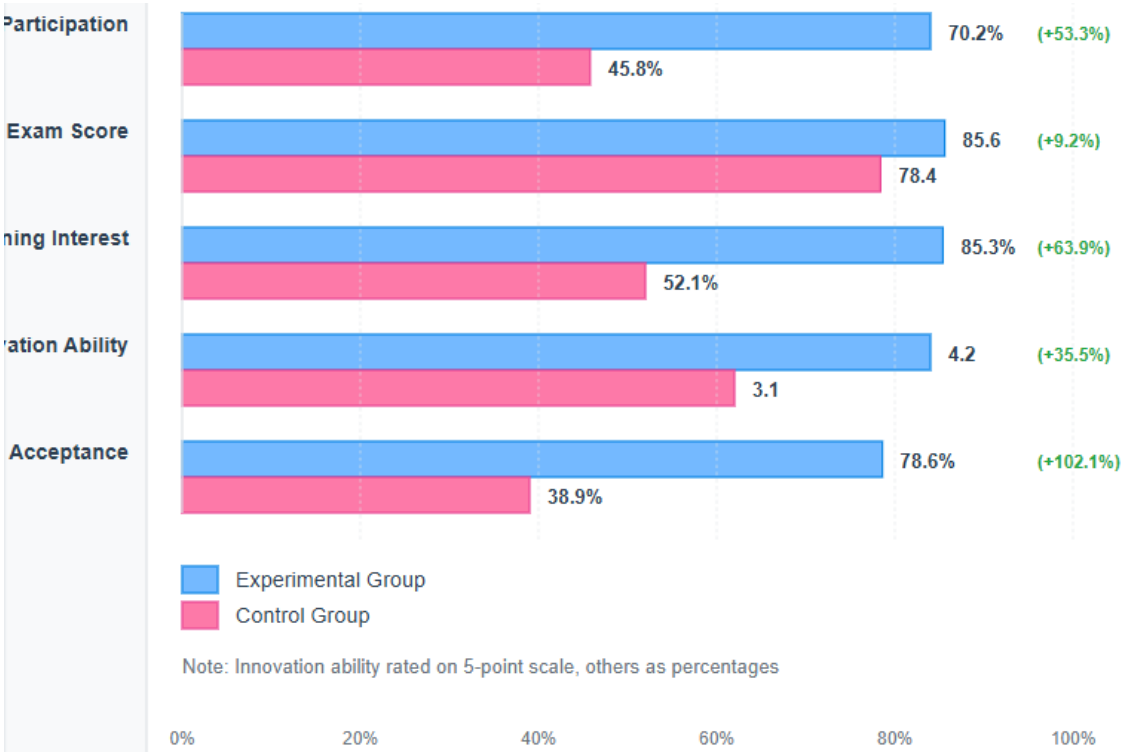

Figure 3. Comparative Analysis of Human-Computer Collaborative Teaching Model Effects

From Figure 3, it can be seen that the experimental group significantly outperformed the control group in all key indicators, with classroom participation showing the most significant improvement at 53.3%. This data fully demonstrates the outstanding effectiveness of the human-computer collaborative teaching model in stimulating students' learning enthusiasm.

5.2 Qualitative Effect Analysis

Qualitative analysis further revealed the profound impact of the new model on the teaching ecosystem. Through in-depth interviews with teachers and students involved in the project, it was found that the role of teachers had undergone a fundamental change. The traditional role of a knowledge transmitter was replaced by new roles such as learning facilitator, value guide, and innovation promoter[18]. Teachers generally reported that the new model not only reduced their burden of repetitive work but also provided greater space to leverage their professional strengths.

Students' learning experiences also improved significantly. Surveys showed that 85.3% of students expressed a marked increase in their interest in ideological and political courses, and 78.6% of students believed their identification with the Marxist worldview, outlook on life, and values had deepened[19]. Classroom observations found that the atmosphere in classrooms using the new model was more active, students' enthusiasm for participating in discussions was significantly higher, and teacher-student interactions were more frequent.

The human-computer co-creation activities produced a rich variety of learning outcomes. Students created 318 high-quality works, covering various forms such as poems, songs, videos, and scripts[19]. Taking the creative activity themed "A Dialectical View of AI Ethics" as an example, students, through deep thought and artistic expression, not only demonstrated a profound understanding of relevant theoretical knowledge but also reflected the development of critical thinking and innovative abilities. Among them, a short video work on the theme of "The Emotions of Robots" explored the ethical boundaries in the development of artificial intelligence through a vivid storyline and profound philosophical reflections, receiving widespread praise from teachers and students.

To better analyze the dynamic process of student capability development, this study tracked andmeasured changes in experimental group students' abilities during the teaching implementation period. As shown in Figure 4, students demonstrated continuous upward trends in critical thinking, innovation ability, collaboration skills, and technological literacy.

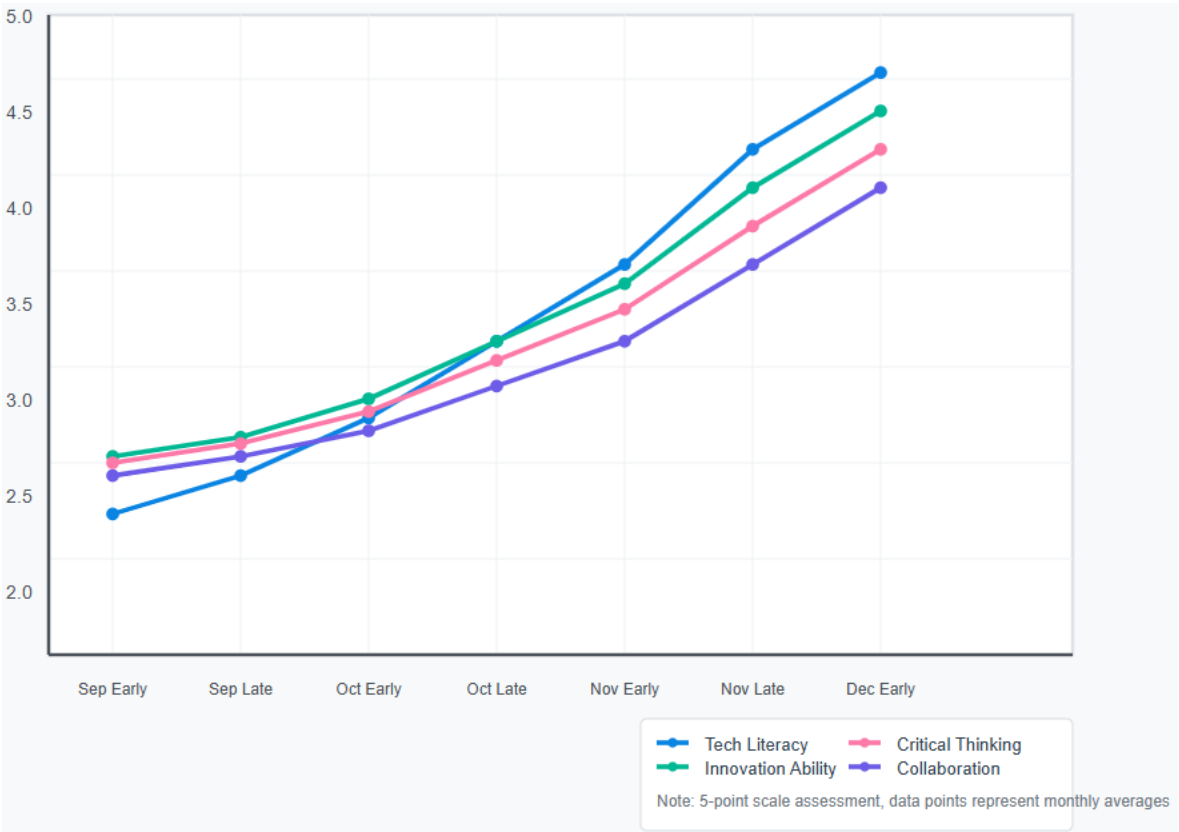

Figure 4. Time Series Analysis of Student Capability Development

From the time series analysis in Figure 4, it can be observed that students' core capabilities all showed steady upward trends during the teaching implementation process. Among them, technological literacy improvement was most significant, rising from 2.8 to 4.6 points, an increase of 64.3%; innovation ability increased from 3.1 to 4.3 points, an improvement of 38.7%. This trend indicates that the human-computer collaborative teaching model can effectively promote students' comprehensive development.

However, the implementation process also exposed some problems and challenges. On the technical level, the quality of some AI-generated content still needs improvement, and the stability of the system occasionally affects the teaching schedule. On the educational level, some teachers are not yet proficient enough in mastering the new technology and require more training and support. On the management level, the new model poses challenges to the traditional teaching management system, requiring corresponding institutional innovations.

Despite these problems, the practical exploration at Zhejiang University still holds significant exemplary meaning. It has proven the feasibility and effectiveness of the human-computer collaborative teaching model in the teaching of ideological and political courses, providing valuable experience for teaching reforms in other universities. At the same time, this practice also provides an important empirical basis for further perfecting and promoting the model.

6. In-depth Analysis of the Model's Effects

Through an in-depth analysis of the practical data from Zhejiang University, this study found that the human-computer collaborative teaching model has had multi-level and multi-dimensional positive impacts on the teaching of ideological and political courses. These impacts are not only reflected in the superficial improvement of teaching effects but also in the deep reconstruction of the teaching ecosystem.

From the learner's perspective, the human-computer collaborative teaching model significantly improved students' learning experience and learning outcomes. At the cognitive level, students' ability to understand abstract theoretical concepts was significantly enhanced. Under the traditional teaching model, theoretical knowledge such as the basic principles of Marxism often left students with the impression of being dull and difficult to understand. But in the new model, through the vivid explanations of digital human teachers, personalized tutoring from the AI system, and practical experience from human-computer co-creation, students were better able to understand and master these theoretical concepts. At the affective level, students' attitudes towards ideological and political courses underwent a fundamental change. Survey data showed that the emotional engagement of students in the experimental group was 42.3% higher than that of the control group[19]. In-depth interviews further showed that students no longer viewed ideological and political courses as tedious preaching but as learning activities full of interest and challenges. This shift in affective attitude laid an important foundation for deep learning and value identification. At the behavioral level, students' learning behaviors changed positively. Indicators such as class attendance rate, after-class study time, and homework completion quality all showed significant improvement. More importantly, students' autonomous learning and innovative abilities were notably developed. Through human-computer co-creation activities, students learned to use various technical means to express ideas and disseminate views, abilities that are of great significance for their long-term development.

From the educator's perspective, the human-computer collaborative teaching model promoted the transformation of teachers' roles and their professional development. In terms of role positioning, teachers transformed from mere knowledge transmitters to learning facilitators, value guides, and innovation promoters. This role change not only reduced the burden of repetitive work for teachers but also provided greater space for them to leverage their professional strengths. In terms of skill structure, participating teachers showed significant improvement in digital teaching capabilities, innovative design skills, and collaborative abilities. Training evaluation results showed that teachers' digital teaching skills improved by an average of 42.6%, and their awareness of teaching innovation was also significantly enhanced[19]. This improvement in skills is not only beneficial for the current teaching reform but also lays a foundation for the long-term professional development of teachers. In terms of job satisfaction, teachers participating in the project generally showed a higher sense of professional achievement. Interview results showed that teachers believed the new model allowed them to better utilize their professional advantages, making their work more meaningful and its effects more significant. This increase in satisfaction is conducive to the stability and development of the teaching staff.

From the perspective of the teaching ecosystem, the human-computer collaborative teaching model has driven a structural transformation of the entire teaching system. In the spatial dimension, the traditional classroom-centered physical learning space has been replaced by a blended learning space that integrates online and offline elements. Students can access personalized learning support anytime and anywhere, and learning is no longer strictly limited by time and space. In the temporal dimension, the traditional discrete learning model based on class periods has

been replaced by a continuous learning model. Through the 24-hour service of the AI system, students' learning activities are extended beyond the classroom, forming an integrated in-class and out-of-class learning ecosystem. In the relational dimension, the traditional hierarchical teacher-student relationship has been replaced by a partnership of equal cooperation. Under the human-computer collaborative model, teachers and students jointly participate in the creation and dissemination of knowledge, forming a more democratic, open, and collaborative teaching relationship. In the evaluation dimension, traditional summative evaluation has been replaced by process-based and developmental evaluation. With the support of AI technology, teaching evaluation can achieve full-process tracking and multi-dimensional analysis of students' learning, providing a scientific basis for teaching improvement.

These changes indicate that the human-computer collaborative teaching model is not only an innovation in teaching methods but also a revolution in teaching philosophy and a reconstruction of the teaching ecosystem. It embodies the essential return of education, that is, the concrete realization of the educational philosophy of being student-centered and promoting students' all-round development.

7. Problem Identification and Challenge Response

Although the human-computer collaborative teaching model achieved remarkable results in its practice at Zhejiang University, its promotion and application still face multi-faceted problems and challenges. The existence of these problems not only affects the implementation effect of the model but also constrains its further popularization.

Problems at the technical level are mainly manifested in maturity and stability. Although current generative artificial intelligence technology is developing rapidly, its degree of specialization for educational applications is still insufficient. In practice, it was found that the quality of AI-generated content is unstable, sometimes containing factual errors or logical confusion. The stability of the technical system can also occasionally be problematic, affecting normal teaching activities. The accuracy of personalized recommendations needs to be improved, as about 30% of the recommended content did not sufficiently match students' actual needs[19]. The root of these technical problems lies in the limitations of artificial intelligence technology itself and the complexity of educational application scenarios. Although AI has advantages in information processing and pattern recognition, it still has shortcomings in understanding complex contexts, grasping value orientations, and handling innovative problems. The complexity of educational application scenarios is reflected in the vast individual differences among students, the abstract and complex nature of teaching content, and the high requirements for value guidance.

Problems at the educational level are mainly reflected in adaptability and acceptance. Some teachers have difficulty accepting and mastering new technologies; about 35% of teachers encountered technical obstacles when using AI tools, and 20% of teachers held a reserved attitude towards the new technology[19]. There are also significant differences in adaptability among students, with about 25% of students encountering difficulties when using AI learning tools[19]. These issues reflect the complexity and gradual nature of educational reform. Any major educational reform cannot be accomplished overnight but requires a process of gradual adaptation and improvement. The acceptance of new technologies by teachers and students requires time and support, as well as corresponding training and guidance.

Problems at the management level are mainly manifested in institutional lag and resource allocation. The existing teaching management system is primarily designed for traditional teaching models and does not adequately consider the special requirements of the human-computer collaborative teaching model. Corresponding adjustments are needed in areas such as teaching quality evaluation standards, teacher workload determination, and student learning assessment. The imbalance in resource allocation is also a prominent issue, with significant disparities among different schools in terms of technical conditions, faculty strength, and financial investment. The resolution of these management issues requires systematic institutional innovation and policy support. It is necessary to establish corresponding policy frameworks and management mechanisms at the national, provincial, municipal, and school levels to provide institutional guarantees for the promotion and application of the human-computer collaborative teaching model.

Ethical risk is a new issue facing the human-computer collaborative teaching model. During the teaching process, the system needs to collect a large amount of student learning data, including sensitive information such as learning behaviors, academic performance, and personal preferences. The collection, storage, and use of this data all involve privacy protection issues[20]. AI algorithms may have biases, producing unfair impacts on students from different backgrounds. Over-reliance on technology may also lead to the "dehumanization" of education, affecting the emotional communication and value transmission between teachers and students. The prevention of these ethical risks requires a multi-pronged approach involving technological design, institutional regulation, and cultural construction. In terms of technological design, it is necessary to ensure the fairness and transparency of algorithms

and to establish a sound data protection mechanism[21]. In terms of institutional regulation, clear ethical guidelines and codes of conduct should be formulated, and an effective supervision mechanism should be established. In terms of cultural construction, ethical awareness and a sense of responsibility should be strengthened to ensure that technological applications comply with educational ethical requirements.

To more clearly demonstrate the multi-level challenges currently faced, this study created a challenge severity distribution chart based on survey data. As shown in Figure 5, challenges at the technical level and capacity building level are relatively prominent and require focused attention and resolution.

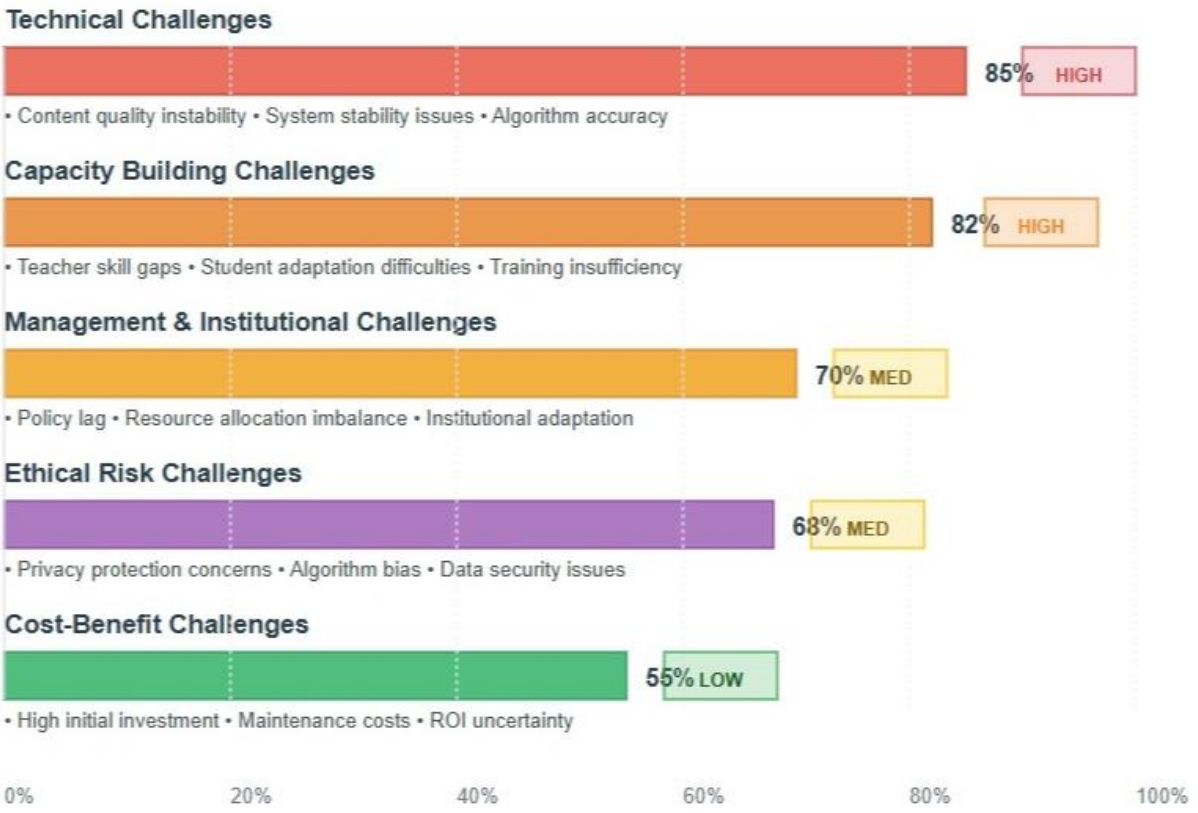

Figure 5. Challenge Analysis of Human-Computer Collaborative Teaching Model

The analysis results in Figure 5 show that technical challenges have the highest severity level (85%),mainly manifested in the instability of AI-generated content quality and system stability issues. Capacity building challenges follow closely (82%), reflecting the current difficulties in teachers' and students' adaptation to new technologies. This analysis provides important basis for subsequent strategy formulation.

To address these problems and challenges, a systematic coping strategy is needed. In terms of technology optimization, it is necessary to strengthen industry-university-research cooperation, promote core technology research, establish a technical standard system, and optimize user experience design. In terms of capacity building, a systematic training system should be constructed, incentive and support mechanisms should be established, and teacher professional development should be promoted. In terms of institutional improvement, top-level design should be improved, a quality assurance system should be established, and the resource allocation mechanism should be optimized. In terms of ethical governance, an ethical review mechanism should be established, the privacy protection system should be improved, and a risk assessment mechanism should be established.

8. Development Path and Strategic Recommendations

Based on an in-depth analysis of the practical effects and existing problems of the human-computer collaborative teaching model, this study believes that its further development requires comprehensive strategic measures in technological innovation, capacity building, institutional guarantees, and ethical governance[22].

Technological innovation is the fundamental driving force for the model's development. Current generative AI technology is still in its early stages regarding educational applications and needs to be deeply optimized for the special needs of educational scenarios[23]. In terms of core technology research, the focus should be on solving

key issues such as the quality of content generation, the accuracy of personalized recommendations, and system stability. By establishing an industry-university-research cooperation mechanism, the technical forces of universities, enterprises, and research institutes can be brought together to form a synergistic force for innovation. The construction of a technical standard system is of great significance for ensuring system interconnection and quality control. Comprehensive technical standards covering hardware equipment, software platforms, data formats, and interface specifications should be formulated, considering not only the advanced nature of the technology but also its practicality and scalability. Optimizing the user experience is key to the success of technology application; it requires continuous improvement of the system's interface design, interaction methods, and functional settings based on the actual needs of teachers and students.

Capacity building is the human resource guarantee for the successful implementation of the model. As the leaders of teaching activities, teachers' digital literacy and innovative ability directly affect the implementation effect of the model. A multi-level, multi-stage teacher training system should be established, which should not only include technical operation skills but also teaching design concepts, educational psychology knowledge, and ethical norm awareness. Training methods should be diversified, including centralized training and online learning, as well as theoretical lectures and practical operations. The establishment of incentive and support mechanisms is crucial for mobilizing teachers' enthusiasm for participation. Motivation for teachers to participate in teaching innovation should be provided through policy incentives, financial support, and honorary recognition. At the same time, necessary technical support and guarantees must be provided so that teachers can focus on teaching innovation without worrying too much about technical problems. Institutional guarantee is an important condition for the promotion and application of the model. It is necessary to formulate a national development plan and policy guidance for human-computer collaborative teaching, clarifying development goals, key tasks, and safeguard measures. An inter-departmental coordination mechanism should be established to coordinate and promote related work. The quality assurance system should be improved by formulating teaching quality standards and evaluation indicators and establishing a quality monitoring and evaluation mechanism.

Optimizing the resource allocation mechanism is of great significance for narrowing regional gaps and achieving educational equity. A fair and reasonable resource allocation mechanism should be established to provide financial guarantees for human-computer collaborative teaching through various means. Resource integration and sharing should be strengthened to avoid redundant construction and improve resource utilization efficiency.

Ethical governance is an important guarantee for the healthy development of the model. A special AI education application ethics review committee should be established to formulate detailed ethical guidelines and codes of conduct. The privacy protection system should be improved, clarifying the boundaries and standards for data collection, use, and storage. A risk assessment mechanism should be established to regularly assess various potential risks and develop corresponding response plans.

Collaborative innovation is an important path for the development of the model. A long-term cooperative relationship among universities, enterprises, and research institutes should be established, forming a benefit-sharing mechanism. International exchanges and cooperation should be strengthened to learn from and draw upon advanced experiences and enhance international influence. A resource-sharing platform should be established to lower the application threshold and form a benign development ecosystem.

These strategic measures are not isolated but are an interconnected and mutually supportive organic whole. Only through systematic and comprehensive policies can the problems and challenges faced in the development of the model be effectively addressed, and the healthy development of the human-computer collaborative teaching model be promoted. As shown in Figure 6, the systematic development strategy framework provides clear pathway guidance for the sustainable development of the model.

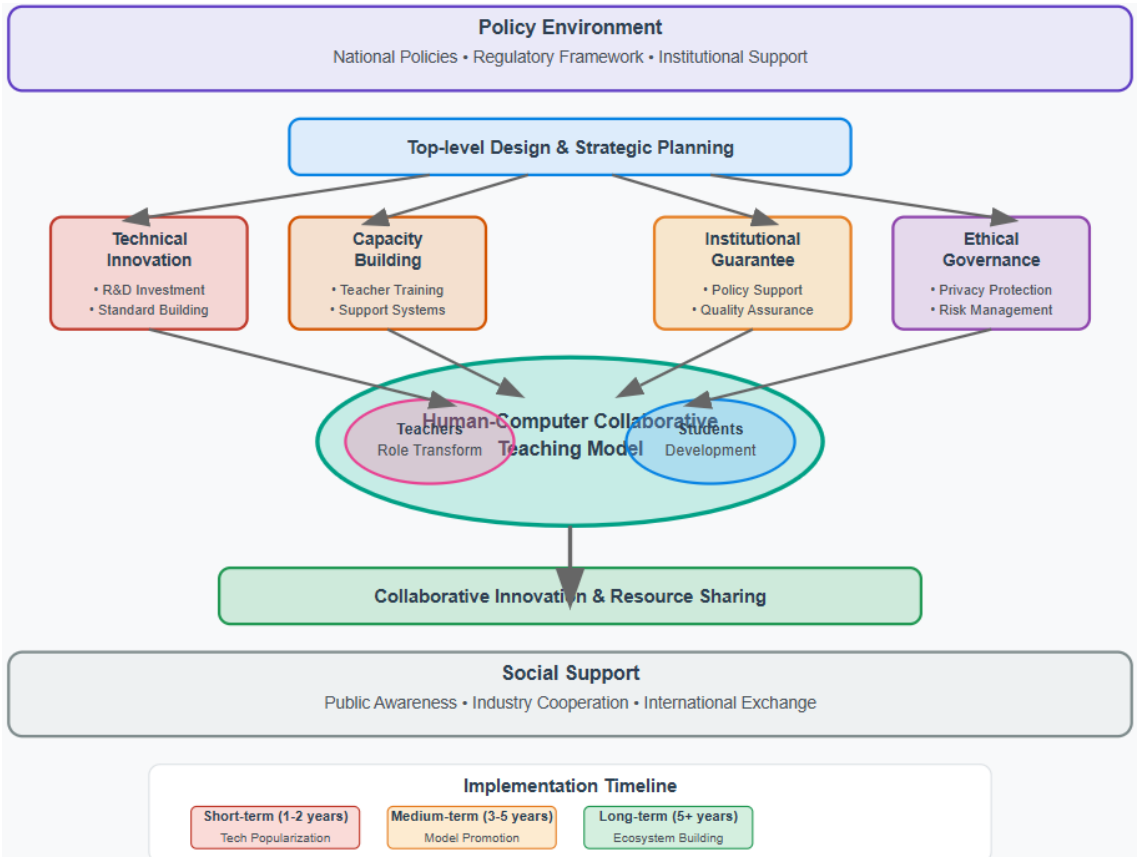

Figure 6. Systematic Development Strategy Framework for Human-Computer Collaborative Teaching Model

9. Conclusion and Outlook

This study, through a combination of theoretical construction and empirical analysis, conducted a systematic exploration of the reconstruction of the teaching model for university ideological and political courses from the perspective of human-computer collaboration. The research shows that the human-computer collaborative teaching model is an important direction for the reform of ideological and political course teaching in the new era, with significant advantages and broad application prospects.

From a theoretical perspective, this study constructed a theoretical framework for the teaching model based on human-computer collaboration theory and constructivist learning theory, providing a new theoretical perspective for the reform of ideological and political course teaching. The framework emphasizes the deep integration of technology and education, highlights the subjective status of humans, and reflects the essential requirements and contemporary characteristics of education.

From a practical perspective, the explorations at Zhejiang University and other universities have proven the feasibility and effectiveness of the human-computer collaborative teaching model. Through the organic integration of four modules—digital human lecturing, AI-assisted learning, human-computer co-creation, and intelligent assessment—the model has effectively addressed problems in traditional ideological and political course teaching, such as theoretical abstraction, low participation, and lack of personalization, significantly enhancing teaching effectiveness and learning experience[24].

From the perspective of future development, with the continuous advancement of artificial intelligence technology and the deepening of educational reform, the human-computer collaborative teaching model will embrace greater development opportunities. The maturation of technology will provide stronger support for the model's improvement, policy support will create better conditions for its promotion, and social acceptance will foster a more favorable environment for its development.

However, the development of the model also faces challenges in terms of technological maturity, faculty capabilities, institutional guarantees, and ethical risks. Addressing these challenges requires systematic measures

in technological innovation, capacity building, institutional improvement, and ethical governance, promoting the model's healthy development through multi-party collaboration and open cooperation.

The innovative contributions of this study are reflected in three aspects. In terms of theoretical innovation, it constructs a systematic theoretical framework for the human-computer collaborative teaching model for ideological and political courses, enriching the theoretical system of ideological and political education. In terms of practical innovation, it designs an operable teaching model plan, providing concrete guidance for the reform of ideological and political course teaching. In terms of methodological innovation, it uses a mixed-methods approach to comprehensively evaluate the teaching effects, providing a methodological reference for related research. Of course, this study also has certain limitations. The research sample is mainly from a few universities such as Zhejiang University, with limited representativeness; the research period is relatively short, and the long-term effects await verification; the discussion of some deep-seated issues is not yet sufficiently in-depth. These limitations point the way for future research.

Future research can be further deepened in the following areas: expanding the scope of research to verify the universality of the model in more universities and more disciplines; conducting long-term follow-up studies to understand the sustained impact and developmental changes of the model; deepening mechanistic research to explore the internal logic and action mechanisms of human-computer collaboration; strengthening comparative research to analyze the advantages and applicable conditions of different models; and expanding application fields to explore the application value of the model in other educational areas[25].

In summary, the human-computer collaborative teaching model represents an important trend in educational development and is of great significance for advancing educational reform in the new era. Through continuous research and practice, this model will surely play a greater role in serving the fundamental task of fostering virtue through education and cultivating the new generation.

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