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Table of Contents

- 1 Research on Improving the Quality of Employment Guidance in Local Universities through Artificial Intelligence**
Canhui Luo
- 9 The Role Adaptation of Rural Primary School Teachers: Challenges and Solutions**
Zhaoyang Zhang
- 17 Research on the Integration Path of Ideological and Political Education in the Design Thinking and Expression Course**
Bing Su, Qin Tong, Yue Ma, Hongsheng Wang
- 25 The Double-Edged Sword of Artificial Intelligence: Ethics and Privacy Protection in Future Exams**
Haidong Sun, Huarui Lu, Diexiang Zhao
- 34 Research on the Path of Talent Cultivation Model for New Engineering Disciplines in the Era of Artificial Intelligence**
Mengru Shen, Baowen Li, Shasha Liu, Hongchun Zhang
- 40 Research on Strategies to Improve Listening Performance in CET-4 Using the Intelligent Laboratory**
Xin Wan, Xiufang Zhang
- 45 Current Situation and Development Strategies for Informatization Education among County High School Students**
Wanjun Li, Xin Liu, Fengyu Zhou
- 55 Review of the “New Crafts” International Exhibition of Arts and Crafts: Focusing on an Integrated Innovation Perspective**
Ji Dong
- 61 Research on the Reform of Hybrid Teaching Content in Transportation Engineering Courses under the Background of Smart Transportation**
Jing Sun
- 67 Analysis of the Complexity and Symbolic Significance of Lensky’s Character in *Eugene Onegin***
Shiwei Liang

- 73 Research on the Path of Integrating Artificial Intelligence into Ideological and Political Education for College Students**
Guixin Feng
- 80 Artificial Intelligence and Children: The Application of AI Devices in Preschool Education**
Yuke Gao
- 86 Practical Research on Ideological and Political Education in Public Basic Courses of Colleges and Universities from the Perspective of “Integrated Ideological and Political Education”**
Zhongyu Zhang
- 94 An Action Research on Music Appreciation Activities in Kindergarten Classes Based on Situational Teaching Approach**
Jin Wu
- 102 A Study on Trainee Teachers’ Stated Beliefs and Their Pedagogical Practices of Oral Corrective Feedback in the Chinese as a Second Language Classroom**
Yang Yang
- 118 Analysis of the Pros and Cons of the Current Chinese Medicine Education System and Strategies for Improvement**
Sanjin Zeng, Heguo Yan, Bingbing Chen, Zhaohu Xie
- 131 An In-Depth Analysis of the Paradigm of Virtual-Reality Fusion in Creating New Media Art in the Context of Meta-Universe**
Yu Wu
- 137 Reconstruction of Ecological Cognition in the Main Soundscape Domain: The Aesthetic Education Synergy Mechanism from the Perspective of Dialectical Contradiction**
Yang Li, Xiang Zhang, Baijun Xie, Xiangqian Zhang, Shirley A. Padua
- 143 Construction of a New Clinical Teaching System for Non-Alcoholic Fatty Liver Disease (NAFLD) based on the Dynamic Training Model Integrating “Guidelines, Clinical Practice, and Scientific Research”**
Suzhen Jiang, Nan Wu
- 149 The Application of Task-Based Language Teaching in College English Teaching in the Information Age**
Hui Zhang
- 155 Scientific Protection and Training Strategies for Badminton Players after Anterior Cruciate Ligament Surgery Recovery**
Xuan Zhou

- 161 Research on the Development and Trends of Dance Video in the New Era**
Fei Lu, Fangjing Hao
- 166 Research on Innovation Paths of Higher Nursing Education in the Context of Smart Teaching**
Yan Liu, Wei Li, Ruining Hu
- 173 Digital Methods in Ideological and Political Education**
Mengru Shen, Baowen Li, Shasha Liu, Hongchun Zhang
- 178 Survey on Career Planning Awareness and Readiness Among Freshman Medical Students in the Context of Digital Medicine**
Peiqi Chen, Qiaojuan Yang, Yan Xie, Yangrong Hu, Yu He, Wenjing Yan
- 187 Cultivation of the Educator Spirit among Mathematics Normal Students: Value, Dilemma, and Path**
Jin Liu, Meng Yan, Yufan Niu
- 198 A New Interpretation of “Unity of Knowledge and Action”: A Theoretical Model of Integrating Traditional Cultural Ecological Wisdom into STEAM Education**
Yang Li, Haiyu Zhang, Baijun Xie, Xiangqian Zhang, Shirley A. Padua
- 204 An Empirical Analysis of the Final Examination Papers in Educational Psychology Course for Undergraduates in Different Educational Majors under the Background of Teaching Reform**
Tian Sun, Yiyang Zhang
- 210 Analysis of the Construction of the Internal Governance Model of Colleges and Universities Based on the Theory of Flat Management**
Chunhua Lu, Hailian Tan
- 217 Practical Exploration and Optimization Path of Teaching Supervision Mechanisms in Colleges and Universities: Analysis of Teaching Quality Data in the Autumn Semester of 2024 at School A, University Z**
Shantong Cai
- 226 Research on the Multiple Collaborations in the Teaching Community of Undergraduate Professional Introduction Course**
Chunling Yang

Research on Improving the Quality of Employment Guidance in Local Universities through Artificial Intelligence

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Abstract: With the continuous increase in the number of university graduates and the intensification of structural contradictions in the job market, employment guidance in local universities faces significant challenges. Based on the theory of digital transformation in education and the application framework of artificial intelligence (AI), this paper explores pathways for AI to enhance the quality of employment guidance in local universities, using employment data of university graduates in Sichuan Province and relevant policy orientations. Through case analysis, survey data, and theoretical research, the study finds that AI can optimize employment guidance processes and improve job-person matching efficiency through intelligent matching, personalized recommendations, and data-driven decision-making mechanisms, thereby facilitating the alignment between talent cultivation in universities and industry demands. The study proposes the construction of an “AI + Employment” ecosystem, the refinement of intelligent evaluation models, and the deepening of university-enterprise collaboration, providing theoretical foundations and practical references for the reform of local university employment guidance systems.

Keywords: Artificial intelligence; Local universities; Employment guidance; Digital transformation; Job-person matching

Online publication: March 6, 2025

1. Introduction

In recent years, the number of university graduates in China has continued to grow, reaching 11.79 million in the 2024 cohort, further exacerbating employment pressure ^[1]. Meanwhile, the digital economy and industrial upgrading have created a large number of emerging job opportunities, yet the structural mismatch between university talent cultivation and market demands remains prominent. As the primary suppliers of regional talent, local universities play a crucial role in shaping the employment competitiveness of graduates. However, traditional employment guidance models exhibit significant shortcomings in information processing efficiency, personalized services, and data-driven decision-making, necessitating breakthroughs

through technological innovation. Artificial intelligence (AI), with its powerful capabilities in data analysis, pattern recognition, and automated decision-making, offers new perspectives for employment guidance. Taking local universities in Sichuan Province as the research focus, this paper explores the theoretical logic and practical pathways for AI to enhance employment guidance quality, considering policy contexts and practical case studies.

2. The value implication of AI-enabled employment guidance in local universities

2.1. Ideological characteristics of contemporary college students

According to the *52nd Statistical Report on China's Internet Development* released by the China Internet Network Information Center (CNNIC), as of December 2023, the number of internet users in China had reached 1.092 billion, an increase of 24.80 million compared to June 2023. The internet penetration rate stood at 77.5%, increasing 1.1 percentage from June 2022. In terms of channels of accessing internet, the number of mobile internet users reached 1.108 billion, with 99.8% of internet users accessing the internet via mobile devices, and the percentage of internet use reached 78.6%.

As members of Generation Z, contemporary college students have grown up in the digital age as “digital natives.” Their way of thinking, learning habits, lifestyle, and entertainment preferences all reflect the characteristics of the “mobile internet generation.” According to incomplete statistics, college students constitute the main force of internet users, occupying the largest proportion in the occupational structure of internet users. They are characterized by active thinking, independence, openness, and strong self-learning abilities. They frequently browse news, engage with social media platforms like Weibo, and watch short videos on platforms such as Douyin and Kuaishou. They are highly receptive to new information, and their thoughts and behaviors are deeply influenced by the internet. Embedded digital habits, strong individual consciousness, and diversified value orientations are the most prominent ideological characteristics of Generation Z college students.

In terms of employment, these traits manifest in several ways. Some Generation Z college students prefer exploring new things online but show little interest in offline activities. Some exhibit a “lying flat” or “Buddhist” mindset, lacking the initiative to explore career opportunities or plan their career paths in advance. When job hunting, many struggle due to unclear self-positioning and mismatched skills, leading to challenges such as “lazy employment” and “delayed employment.” These factors ultimately affect the overall quality of employment among college graduates.

2.2. AI development accelerates the transformation of employment services

The Third Plenary Session of the 20th Central Committee of the Communist Party of China proposed the goal of “establishing a sound mechanism for promoting high-quality and sufficient employment.” This objective reflects the Party and the nation’s strong emphasis on employment. High-quality and sufficient employment not only entails an increase in job opportunities but also an improvement in employment quality, including job stability, salary levels, and career development prospects. To achieve this goal, a series of policy measures must be implemented to ensure the healthy development of the job market.

The *14th Five-Year Plan for Employment Promotion* issued by the State Council explicitly calls for “promoting the digital and intelligent transformation of employment services.” With the rapid development of the digital economy, digitalization and intelligence have become major trends in employment services. Advancing the digital and intelligent transformation of employment services can enhance efficiency and

quality, providing job seekers and recruiting enterprises with more convenient and effective services. It also put forward the proposed *The Construction of an Intelligent Employment Service Platform*, aiming to further implement the action of “using data to empower the cloud,” promote the digital transformation and empowerment of traditional offline business forms, and create more job opportunities in the digital economy, thereby offering better employment services to university graduates and enterprises.

3. Theoretical basis

The renewal of educational philosophy in the digital transformation of education mainly refers to the comprehensive integration of digital technology into the field of education to achieve precise and personalized services. In today’s digital era, the rapid development of digital technology has brought profound changes to the education sector. According to the theory of digital transformation in education, traditional education models can no longer meet students’ diverse learning needs or the demands of society for talent. Therefore, it is necessary to comprehensively restructure educational processes using digital technology. Through digital teaching platforms, online educational resources, and intelligent teaching tools, it is possible to achieve personalized content delivery, real-time monitoring and evaluation of learning progress, and optimized allocation of teaching resources, thereby improving the quality and efficiency of education.

The concept of intelligent matching is based on big data and algorithms to optimize the efficiency of information matching between suppliers and demand sources. In the job market, a large number of job seekers and recruiting companies face severe information asymmetry, which significantly impacts employment efficiency. Intelligent matching theory utilizes big data technology to collect and analyze relevant information from both job seekers and employers, including job seekers’ personal details, academic performance, career preferences, and work experience, as well as employers’ job requirements, company size, and industry characteristics. By applying algorithmic models to match and analyze this information, the theory identifies the most suitable job seekers for specific positions, thereby enhancing the efficiency and accuracy of job matching.

Career construction theory advocates for dynamically adjusting career planning, aligning with AI technology’s capability to track and provide feedback on students’ career development^[2]. Career construction theory posits that career development is a continuous process of change and adjustment, influenced by various factors such as personal interests, abilities, values, and social environments. Consequently, career planning should also be dynamic and flexible, requiring timely adjustments based on individual development and changes in the social environment. AI technology can facilitate dynamic tracking and feedback on students’ career development by collecting data on their academic performance, internship experiences, and career preferences. Through analyzing students’ career trajectories and potential, AI can provide personalized career planning advice and guidance. These theories provide a solid theoretical foundation for AI-driven career guidance in local universities, ensuring that AI applications in employment counseling are theoretically grounded and justified.

4. Analysis of the current status and issues of employment guidance in local universities

Based on survey data from 647,000 graduates of the 2024 cohort in Sichuan Province^[3], there are several issues in career guidance at local universities.

4.1. Low efficiency in matching supply and demand for employment

From the perspective of graduates, 22.21% of graduates prefer careers in the education sector (*Report on Students' Source Information and Employment Intention of 2024 College Graduates in Sichuan Province*), while there is a 30-million job gap in the digital economy sector (*Industrial Digital Talent Research and Development Report 2023*)^[4], indicating a strong concentration of employment preferences. This phenomenon reflects graduates' relatively traditional career outlook and limited awareness of emerging industries and job opportunities. The education sector has long been considered a stable and respectable career choice, making it highly attractive to graduates. However, as the digital economy rapidly expands, competition in the education job market has intensified, while demand in the digital economy sector remains unmet.

On the employer side, there is a disconnect between corporate hiring needs and graduates' skill profiles, leading to low efficiency in supply-demand matching. Corporate hiring needs continuously evolve with market demand and business strategies, causing shifts in required skills. However, career guidance departments at local universities often fail to update their understanding of the latest job market trends or dynamically adjust graduates' competency profiles. This mismatch between employer expectations and graduates' abilities negatively impacts employment efficiency.

4.2. Insufficient precision in guidance services

On one hand, 73.5% of students believe career guidance courses are “outdated and lack relevance,” indicating an issue of content homogenization. Traditional career guidance courses typically use standardized materials and teaching methods, neglecting students' individualized career development needs. The course content mainly focuses on employment policies and job-seeking skills, with insufficient coverage of emerging industries and job market analysis, making it difficult to meet students' actual needs.

On the other hand, employment information platforms are not integrated with talent development data, leading to a job recommendation accuracy rate of less than 40%. The fragmentation of resources negatively affects the precision of career guidance services. Employment information platforms serve as crucial channels for local universities to provide job placement services, but many of these platforms operate independently from student academic and skills data, preventing effective data sharing and integration. As a result, these platforms fail to recommend suitable job opportunities based on students' academic performance, professional skills, and career preferences, undermining the effectiveness of career guidance.

4.3. Weak data-driven capabilities

Traditional assessment methods primarily rely on subjective questionnaires and expert interviews, making it difficult to track students' skill development and employer demand fluctuations in real time. The lack of data-driven capabilities limits the effectiveness of career guidance. While subjective surveys and expert interviews can provide some insights, they suffer from strong subjectivity, small sample sizes, and poor timeliness. Given the rapidly changing job market and diverse student needs, traditional evaluation methods no longer meet the demands of modern career guidance. A data-driven approach to career guidance can analyze and mine large employment datasets, enabling real-time tracking of students' skills and employer demand shifts. This provides scientific insights and decision-making support for career guidance. However, local universities still face significant challenges in data collection, analysis, and application, resulting in weak data-driven capabilities that limit the effectiveness and quality of career guidance services.

5. Practical paths for AI-enabled employment guidance

5.1. Construction of an intelligent matching system

The first step is data integration, which involves aggregating students' academic performance, internship experience, and career preferences to construct a "Student Competency Profile." Academic performance reflects students' mastery of professional knowledge, internship experience demonstrates their practical skills and professional qualities, and career preferences indicate their interests and inclinations toward different professions. By integrating these data points, a comprehensive and accurate understanding of students' abilities and characteristics can be achieved, providing fundamental data for intelligent matching.

For example, a polytechnic university in Sichuan Province has established an "AI Employment Data Center," integrating data from the university's academic system and the [24365] platform, which has increased the matching accuracy to 68%. The AI Employment Data Center enables centralized management and sharing of student information by combining data from internal academic systems and the [24365] platform. Meanwhile, AI technology is employed to analyze and mine these data, constructing a "Student Competency Profile" that is precisely matched with enterprise job requirements, significantly improving matching accuracy.

The second aspect is algorithm optimization, utilizing collaborative filtering algorithms and natural language processing (NLP) technology to achieve precise matching between job requirements and student profiles. Collaborative filtering is a recommendation algorithm based on user behavior data, which analyzes historical behaviors and preferences to suggest similar items or services. In employment guidance, collaborative filtering algorithms can analyze students' job search history and career preferences to recommend similar job positions. NLP technology, on the other hand, can perform semantic analysis on companies' job postings and students' résumés, extracting key information to achieve accurate matching between job requirements and student profiles.

5.2. Personalized career development support

The first component is intelligent assessment and feedback. For instance, an agricultural university in Sichuan Province has implemented an AI career assessment system that utilizes machine learning to analyze students' personalities and career inclinations, with a customized recommendation adoption rate reaching 82%. The AI career assessment system employs machine learning algorithms to comprehensively evaluate students' personality traits, interests, and competencies, analyzing their career tendencies and potential. Based on the assessment results, personalized career development suggestions and guidance are provided, helping students better understand themselves and formulate reasonable career plans. The practice at Sichuan Agricultural University demonstrates that an AI career assessment system can offer students more precise and individualized career development support, enhancing their career planning skills and employment competitiveness.

The second component is leveraging VR technology to simulate interviews and workplace environments, enhancing students' practical skills and creating virtual training scenarios. VR technology, characterized by immersion, interactivity, and imagination, can provide students with realistic interview and workplace settings. By simulating interview scenarios with VR technology, students can conduct multiple mock interviews, familiarize themselves with interview procedures and techniques, and improve their interview skills. Additionally, VR technology can be used to create virtual training environments where students can engage in hands-on practice in a simulated setting, enhancing their practical abilities and professional

competencies.

5.3. Dynamic decision-making and curriculum optimization

On the one hand, based on enterprise recruitment data and industry trends, a demand forecasting model can be built to dynamically adjust enrollment scales for different majors. Enterprise recruitment data and industry trends reflect the market's demand for talent. By analyzing and mining this data, future market demand trends for various majors can be predicted. Local universities can use demand forecasting models to dynamically adjust enrollment scales, optimize the structure of academic programs, and enhance the relevance and adaptability of talent cultivation.

For example, a comprehensive university in Sichuan used AI to analyze regional industry demands and introduced three interdisciplinary majors, including “Intelligent Medical Technology” in 2023. By leveraging AI technology to analyze regional industry demands, the university identified a rapid increase in the demand for talent in the intelligent medical field. Consequently, it promptly introduced “Intelligent Medical Technology” and two other interdisciplinary majors to meet market needs. This initiative not only improved the university's talent cultivation quality and employment competitiveness but also contributed to regional economic development.

On the other hand, micro-courses such as “Python Skills Enhancement” and “Workplace Communication Training” can be recommended based on students' weak areas, enabling intelligent course recommendations. Every student has different learning situations and ability levels. By analyzing students' learning data and assessment results, their weak areas can be identified. Subsequently, targeted micro-courses can be recommended to help students improve their skills in a focused manner. Intelligent course recommendations can enhance learning efficiency and effectiveness, promoting students' overall development.

6. Challenges and countermeasures

Although artificial intelligence offers significant advantages in employment guidance at local universities, it also faces certain challenges that require appropriate countermeasures.

6.1. Challenges

First, data privacy risks—student information collection must comply with the requirements of the Personal Information Protection Law. The AI-powered employment guidance process requires collecting large amounts of student data, including personal information, academic performance, and career preferences. This data involves students' privacy, and if mishandled, it could lead to data breaches and unnecessary losses for students. Therefore, when collecting and using student information, it is crucial to strictly adhere to the Personal Information Protection Law and implement effective security measures to safeguard student data.

Second, technological dependence and lack of humanistic guidance—overreliance on algorithms may lead to insufficient career value orientation. While AI technology can provide precise employment guidance and services, it cannot replace human emotions and values. Excessive reliance on algorithms may result in a lack of humanistic care in career guidance, neglecting students' individuality and personal needs. Additionally, algorithmic decisions are based on data and models, often lacking direction in shaping students' career values, which may lead to biases in their career choices.

6.2. Countermeasures

First, establishing an “AI + Humanities” dual-driven model by embedding the guidance of socialist core values into intelligent recommendations. While utilizing AI technology for career guidance, it is essential to emphasize humanistic care and value-based guidance. By integrating socialist core values into intelligent recommendation systems, students can be guided to develop correct career values and employment perspectives, fostering their sense of social responsibility and professional ethics.

Second, deepening school-enterprise collaboration by jointly developing customized AI tools with technology companies, such as an “AI Resume Diagnosis System.” School-enterprise collaboration is a crucial approach to promoting the application of AI in career guidance. Through cooperation with enterprises, universities can leverage companies’ technological expertise and practical experience to develop AI tools that better align with market demands and students’ actual needs. For example, an “AI Resume Diagnosis System” can use AI technology to analyze and evaluate students’ résumés, identify issues, and provide corresponding revision suggestions, helping students enhance the quality of their résumés and increase their employment opportunities.

Third, improving policy support by establishing special government funds to support the intelligent transformation of local university employment service platforms. Local governments can set up dedicated funds to provide financial assistance for the digital upgrading of university employment service platforms. Additionally, policies should be formulated to encourage universities and enterprises to strengthen cooperation and jointly promote the application of AI in career guidance. A well-developed policy framework can create a favorable environment and development space for the application of AI in employment guidance at local universities.

7. Conclusion

Artificial intelligence technology provides technological support and innovative pathways for improving the quality of employment guidance in local universities. Through intelligent matching, data-driven decision-making, and personalized services, AI can effectively alleviate the supply-demand mismatch and promote high-quality employment for graduates. In the future, further exploration is needed to deepen the integration of technology and education, building a sustainable smart employment ecosystem. Subsequent research should focus on assessing the effectiveness of AI applications in career guidance and finding ways to balance technological applications with humanistic care to continuously optimize employment guidance in local universities.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Ministry of Education, 2024, 2024 National Online Video Conference on Employment and Entrepreneurship of College Graduates, Beijing.
- [2] Savickas ML, 2012, Career Construction Theory and Practice, in Brown SD, Lent RW, (Eds.), Career Development and Counseling: Putting Theory and Research to Work, Wiley, 147–183.

- [3] Sichuan Provincial Education Department, 2024, Annual Report on the Employment Quality of College Graduates in Sichuan Province (2024), Chengdu.
- [4] Zhaopin.com, 2024, Research Report on College Students' Employability, Beijing.

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The Role Adaptation of Rural Primary School Teachers: Challenges and Solutions

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Abstract: This study examines the role adaptation of rural primary school teachers through a literature review, summarizing the current research on general practice teachers and identifying emerging trends. Interviews were conducted with four rural primary school teachers, revealing key challenges: an incomplete understanding of their responsibilities as head teachers, a lack of theoretical and practical guidance in their role as learners, and insufficient research skills in their role as researchers. To address these issues, the study recommends reducing the number of subjects taught by general practice teachers in rural primary schools and providing targeted training, strengthening professional guidance and improving compensation, offering high-quality learning resources and encouraging further education, and establishing educational alliances to enhance teachers' research capabilities.

Keywords: General practice teacher; Teacher role; Role adaptation

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1. Introduction

In 2012, the Ministry of Education, along with other ministries and commissions, issued the *Opinions on Vigorously Promoting the Construction of Teachers in Rural Compulsory Education*, advocating for special enrollment methods such as targeted entrusted training to expand the training scale of bilingual teachers, as well as teachers in music, physical education, and the arts for primary schools^[1]. In 2014, the Ministry of Education, in its *Opinions on the Implementation of the Excellent Teacher Training Plan*, proposed cultivating a cohort of outstanding primary school teachers who are passionate about education, possess extensive knowledge, demonstrate comprehensive abilities, and are capable of meeting the demands of multidisciplinary primary education^[2]. Since then, teachers have gradually become more integrated into the domestic academic field. In December 2022, the China Rural Education Development Research Institute of Northeast Normal University released the *China Rural Education Development Report 2020–2022*, which revealed that a gap still exists between urban and rural primary school teachers, with rural teachers generally having lower qualifications than their urban counterparts^[3]. Therefore, greater attention should be given to rural primary school teachers, ensuring that the remaining teachers can successfully adapt to their roles and deliver quality education.

2. Research status of related issues

The study conducted a literature search on CNKI with the keywords “general practice teachers,” “teacher role,” and “role adaptation.” The search found that the main research contents on the role adaptation of general practice teachers and teachers include the following aspects:

2.1. Research on general practice teachers

Current research on general practice teachers primarily focuses on four key areas: the conceptual framework, teacher training, teacher quality, and training strategies.

In terms of conceptual research, two main viewpoints emerge. The first argues that general practice teachers are established to meet the practical needs of rural primary schools; therefore, they should be capable of adapting to primary school curricula, conducting teaching and research activities, and managing classrooms effectively ^[4]. The second viewpoint emphasizes the integration and collaboration of teachers across disciplines. General practice teachers should align students’ interests with societal needs by implementing thematic curriculum development and integrated curriculum instruction ^[5]. Regarding teacher quality, some researchers suggest that the professional competencies of primary school general practice teachers encompass three main aspects: professional values and ethics, professional knowledge, and professional skills ^[6]. The construction of a literacy model for these teachers can be approached from two dimensions: general literacy and subject-specific literacy ^[7]. The core competencies of general practice teachers should not only enhance teacher education but also contribute to their holistic professional development ^[8]. Training strategies should address both pre-service education and in-service professional development.

2.2. Research on the concept of teacher roles

Numerous studies have explored the concept of teacher roles, with researchers defining teachers’ identities and functions based on different historical periods and perspectives. Some scholars have categorized the evolution of teacher roles across different communication eras, including oral communication, handwritten newspapers, print and electronic media, and digital networks ^[9]. Over the past five years, research has largely focused on how advancements in information technology have influenced teacher roles. For instance, some scholars argue that in human-machine collaborative education, teachers should act as developers, users, and responsible facilitators of AI-driven education ^[10]. Others propose that teachers should take on roles as guides, conversational partners, and catalysts for student awakening ^[11]. In the context of rural education, teachers are increasingly viewed as promoters and leaders of educational revitalization, as well as active participants in community development ^[12]; however, research in this area remains limited. The concept of teacher role adaptation is typically analyzed through the lens of role positioning and adaptation. Overall, research in this field continues to deepen.

2.3. Research on teachers’ role adaptation

The adaptation of rural teachers to their roles has received increasing attention as a significant issue. Rural teachers face challenges such as a “significant gap in living conditions,” “difficult interpersonal communication,” and “limited opportunities for professional development” ^[13]. Their role adaptation can be categorized into three key aspects: cultural adaptation, psychological role adaptation, and professional adaptation ^[14]. The primary challenges faced by new teachers in primary and secondary schools can be further classified into psychological adaptation, teaching adaptation, interpersonal relationship adaptation, school

environment adaptation, and social environment adaptation^[15].

2.4. Research on strategies for teachers' role adaptation

Existing research suggests that strategies for improving teachers' role adaptation primarily focus on three levels: individual teachers, schools, and society. At the individual level, teachers need to acknowledge role conflicts^[16], develop self-encouragement strategies, make psychological adjustments, engage in continuous learning, enhance their professional competencies, and plan their careers effectively. At the school level, the emphasis is on creating a supportive external environment, which includes in-service training, interpersonal support within schools, work-related support, and institutional support. Additionally, strengthening pre-service education and training, improving teacher support systems, and enhancing welfare policies are considered essential measures^[17]. Some studies also highlight the importance of gaining students' understanding and securing parental support.

Overall, research on teachers' role adaptation remains relatively limited. Existing studies predominantly employ qualitative research methods, often relying on small sample sizes, with a lack of large-scale studies. Regarding research subjects, studies have primarily focused on primary and secondary school teachers, kindergarten teachers, and teachers of Chinese as a foreign language. However, there is a noticeable gap in research on the role adaptation of primary school teachers, particularly rural primary school teachers. In general, the existing body of research on the role adaptation of primary and secondary school teachers remains insufficient, and further in-depth analysis of underlying causes, along with the development of systematic theoretical countermeasures, is needed.

3. Definition of the core concepts

3.1. General practice teachers

General practice teachers are not merely educators capable of teaching multiple subjects; they must also possess the ability to integrate and transcend disciplines through collaboration and research, all while maintaining a deep understanding of children. In the era of artificial intelligence, general practice teachers serve as a guide to educational resources and student development^[18]. Meanwhile, Wang and Cai defined a general practice teacher as one who strives for excellence and embodies a broad vision and interdisciplinary thinking^[19].

3.2. The role of general practice teachers

Amid the ongoing curriculum reform, teachers assume eight key roles: knowledge instructor, learner, student mentor, curriculum developer, teaching organizer, team leader, educational researcher, and cultural creator^[20]. The role of general practice teachers encompasses these same responsibilities, requiring them to impart knowledge, engage in continuous learning, guide students, develop curricula, organize teaching, lead teams, conduct educational research, and foster cultural growth.

3.3. Role adaptation of general practice teachers

Role adaptation refers to the physiological and psychological attributes necessary for an individual to effectively fulfill a specific role. It also denotes the level of coordination and unity between the individual and their role within social and economic activities^[21]. The role adaptation of general practice teachers entails possessing the required cognitive and psychological traits for their multifaceted responsibilities, including

knowledge dissemination, continuous learning, student guidance, curriculum development, teaching organization, team leadership, educational research, and cultural creation. Furthermore, it emphasizes the seamless coordination and organic integration of these roles within the educational environment.

4. Role adaptation dilemma and analysis of rural primary school teachers

In the study, four teachers, A1, A2, A3, and A4, were interviewed as research samples, and the plight of rural primary schools was analyzed according to the interview content. The basic info of the four teachers is shown in Table 1.

Table 1. Basic info of teachers

Name	Gender	Marital status	Graduate institutions	Specialty	Graduation year	Work unit	Professional title	Whether or not a head teacher	Teaching subjects
A1	Female	Unmarried	Z Teachers College	Primary Education (General Teacher)	2021	L County G township central primary school	Secondary teachers in primary and secondary schools	Yes	Math, English, fine art
A2	Female	Unmarried	Z Teachers College	Primary Education (General Teacher)	2020	H County X Town central primary school	Secondary teachers in primary and secondary schools	Yes	Math, English
A3	Male	Unmarried	Z Teachers College	Primary Education (General Teacher)	2020	H County Q township a village primary school	Secondary teachers in primary and secondary schools	Yes	Math, English, sports, music
A4	Female	Unmarried	Z Teachers College	Primary Education (General Teacher)	2021	L County F Town middle school primary school	Secondary teachers in primary and secondary schools	Yes	Language, morality, and the rule of law

4.1. Challenges of rural primary school general practice teachers

The advantage of general practice teachers is their ability to integrate disciplines, break down subject barriers, and establish meaningful connections across different fields. However, the downside is that, in practice, the lack of specialized expertise often leads to professional identity confusion among general practice teachers.

Regarding the teaching subjects of the four interviewed teachers, A1 teaches mathematics, English, and art; A2 teaches mathematics and English; A3 teaches mathematics, English, physical education, and music; and A4 teaches Chinese, morality, and rule of law. It is evident that general practice teachers are responsible for multiple subjects, with some even having to switch subjects annually. Each teacher handles more than a dozen classes per week. In general, these teachers are expected to teach everything. However, feedback from the teachers themselves indicates that they still have preferred subjects and areas where they feel less competent. A key reason for these varied teaching assignments is that schools are required to offer a full curriculum as mandated by higher authorities. Yet, these schools—often small rural institutions or micro-schools—frequently struggle with a shortage of qualified staff. As a result, under the broad categorization of “language, mathematics, English, music, physical education, and arts,” teachers are expected to cover all subjects. When assigning teaching responsibilities, schools often prioritize filling subject gaps rather than considering the actual expertise and professional strengths of general practice teachers.

4.2. The heavy burden of being a head teacher

All four interviewed teachers also serve as head teachers. Their assignments to this role were determined by various factors rather than personal choice. Serving as a head teacher is both time-consuming and exhausting, with student management being particularly complex. Some schools implement a dual head teacher system, which provides new general practice teachers with some relief, reducing their workload and pressure. However, in schools without assistant head teachers—especially boarding schools—head teachers experience significant stress and fatigue. According to the feedback from the four teachers, the main challenge of being a head teacher is the gap between theoretical knowledge and practical student management. Most teachers expressed that taking on the role of head teacher requires a period of exploration and adaptation before they can effectively fulfill their responsibilities.

4.3. Learners who lack guidance

Based on interviews with the four teachers in their role as learners, each teacher has their own experiences and learning methods. However, due to the limited availability of local educational resources, general practice teachers in micro-schools often find themselves without anyone to consult when they encounter challenges. Additionally, some teachers rely solely on pursuing a master's degree to enhance their learning. Overall, rural primary school general practice teachers lack long-term learning plans and adequate guidance. Furthermore, their learning is primarily confined to educational content, with limited access to diverse learning styles. In most cases, they rely on a few senior teachers for assistance, as well as related books and course videos.

4.4. Weak researchers

In the field of education and teaching, teachers should not only fulfill their role as educators but also strive to develop as researchers. Interviews with the four teachers revealed that they each face challenges in assuming the role of a researcher. A common issue is their insufficient research capabilities, which hinder their ability to effectively engage in research. One key reason for this is the absence of teaching and research groups in some micro-schools, while in others, research activities are infrequent. Teaching and research efforts primarily focus on lesson planning and open-class teaching. However, as Teacher A4 noted, these activities often fail to achieve the desired impact, lacking depth and remaining largely superficial.

5. Rural primary school teachers' role adaptation to address challenges

5.1. Reducing the number of subjects taught and providing targeted training

At present, rural primary school teachers are responsible for teaching multiple subjects, leading to an excessive workload. To alleviate this burden, measures should be implemented to reduce the number of subjects they are required to teach. General practice teachers are not expected to master every subject; instead, their assignments should be based on their academic background in the arts or sciences, professional expertise, personal interests, and the reality of teacher shortages in specific subject areas. Moreover, existing teacher training primarily focuses on theoretical and practical aspects of education or subject-specific knowledge, with little attention given to the unique challenges faced by general practice teachers. Training programs should, therefore, emphasize interdisciplinary communication and integration, equipping teachers with both pedagogical skills and a broad, cohesive teaching mindset. This approach will help cultivate well-rounded general practice teachers who can effectively navigate their diverse teaching responsibilities.

5.2. Strengthening guidance for rural primary school teachers and enhancing their compensation

Interviews indicate that many rural primary school teachers are in the early stages of their careers, with some assuming the role of head teacher for the first time and lacking relevant experience. In rural areas, where a significant number of students are “left-behind children”—those whose parents have migrated for work and are cared for by grandparents or other relatives—the responsibilities of general practice teachers become even more demanding and complex. To support these teachers, schools and education authorities should integrate resources and provide targeted guidance tailored to the specific conditions of rural primary schools, the characteristics of rural students, and the practical needs of general practice teachers. A clear, actionable guide should be developed to assist head teachers in effectively managing their classes. Additionally, inadequate compensation for head teachers negatively affects their professional identity and motivation. Improving their salaries and benefits will help strengthen their sense of role recognition, enabling them to develop into competent and dedicated head teachers more quickly.

5.3. Providing high-quality learning resources for rural primary school teachers and encouraging further study

Due to their unique circumstances, rural primary schools often struggle with insufficient learning resources and a lack of professional learning communities. General practice teachers in these schools face challenges such as limited access to educational materials and the absence of a structured learning system. To address these issues, rural primary schools should integrate available learning resources to enhance teachers’ professional development. Based on the learning needs of general practice teachers, schools should procure educational courses, professional books on pedagogy, and subject-specific materials. Additionally, establishing collaborative learning communities among general practice teachers, implementing a structured semester-based learning system, and strengthening evaluation and feedback mechanisms will foster a culture of continuous professional growth. Furthermore, schools should promote exchanges and cooperation with other institutions to expand access to off-campus learning resources. Efforts should be made to facilitate the sharing and joint development of learning materials with other schools. For general practice teachers who plan to pursue further studies, schools should reasonably adjust their teaching workloads to alleviate work-related pressure, allowing them the necessary time to prepare for postgraduate entrance exams. Actively encouraging teachers to enroll in in-service graduate programs will further support their professional advancement.

5.4. Forming educational alliances with universities and research institutions to improve scientific research capabilities

Teaching research is crucial for teachers’ professional growth. However, many general practice teachers struggle with weak research skills. On one hand, school-based teaching and research groups often fail to provide adequate leadership; on the other hand, teachers’ scientific research capabilities remain underdeveloped, progressing at a slow pace. To address this, schools should strengthen the role and effectiveness of internal educational research groups by conducting regular research activities and implementing supervision mechanisms to ensure meaningful outcomes. At the same time, schools should encourage general practice teachers to engage in educational research by expanding access to research resources. Forming alliances with universities and research institutions will provide teachers with greater opportunities to enhance their research abilities. Additionally, teachers themselves must take an active role

in improving their teaching and research competencies. They should strive to become both educators and researchers rather than remaining solely in the role of instructors. Regular reflection on teaching practices, continuous learning about educational research, and the gradual development of research skills will enable teachers to better adapt to their dual roles as educators and researchers.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Ministry of Education of PRC, 2020, Opinions on Vigorously Promoting the Construction of Teachers in Rural Compulsory Education, viewed February 26, 2025, https://www.gov.cn/zhengce/zhengceku/2020-09/04/content_5540386.htm
- [2] Ministry of Education of PRC, 2014, The Opinions of the Ministry of Education on the Implementation of the Excellent Teacher Training Plan, viewed February 26, 2025, http://www.moe.gov.cn/srcsite/A10/s7011/201408/t20140819_174307.html
- [3] Wang P, 2023, In the Future, Rural Education Still Faces Challenges that Cannot be Ignored, China Youth Daily, January 9, 2023, (06).
- [4] Zhou D, Xue J, Zeng X, et al., 2007, Research on the Curriculum System of Five-Year Primary School Teachers. Journal of Educational Science, Hunan Normal University, (06): 91–96.
- [5] Tao Q, Lu J, 2014, Analysis of the Necessity of Training General Teachers in Rural Primary Schools. Research on Teacher Education, 26(06): 11–15 + 21.
- [6] Cai Q, Lu M, Yuan T, et al., 2020, Research on the Cultivation of Professional Literacy of Primary School General Practice Teachers. Curriculum Teaching Material Teaching, 40(01): 123–129.
- [7] Mao T, 2023, Future-Oriented and Leading Outstanding Primary School General Practice Teacher Training System Architecture. Shaanxi Education (Higher Education), (01): 60–63.
- [8] Ma W, 2023, Construction of the Core Literacy Structure Model of General Practice Teachers Based on Rooted Theory. Journal of Qinghai Normal University (Social Science Edition), 45(04): 123–134.
- [9] Luo S, Jin Y, 2020, The Crisis, Causes and Responses of Teachers' Role in the Intelligent Age——Based on the Scene Theory's Perspective. Teacher Education Research, (03): 53–59.
- [10] Qin D, Zhang L, 2020, Teacher Role Reconstruction in Human-Machine Collaborative Teaching. Audio-Visual Education Research, 41(11): 13–19.
- [11] Wei M, He Z, 2021, Ontology, Understanding and Value: The Technical Ethical Risk Concern and Governance Path of Intelligent Education. Modern Distance Education, <https://doi.org/10.13927/j.cnki.yuan.20211012.005>
- [12] Guo S, Tian Y, Zheng C, 2019, Reorientation of the Roles and Functions of General Practice Teachers in Primary Schools in the Context of Rural Revitalization. Contemporary Education Science, (08): 52–56 + 83.
- [13] Yin R, Zhu P, Yang Y, 2021, Problems and Countermeasures of the Role Adaptation of New Enrolled Mathematics Teachers in Rural Primary Schools. Teacher, (14): 70–72.
- [14] Chen F, Wu X, 2019, The Adaptation Obstacles and the Solution of the Professional Role of Rural Teachers. Educational Theory and Practice, 39(35): 28–32.
- [15] Lee D, 2013, Study on Professional Role Adaptation of New Teachers in Primary and Secondary Schools in China, dissertation, Henan Normal University.

- [16] He T, 2013, Role Conflict and Role Adaptation of New Teachers in Colleges and Universities. *Adult Education in China*, (21): 121–123.
- [17] Xu X, 2016, Investigation on the Role Adaptation of New Head Teachers in Primary Schools, dissertation, Fujian Normal University.
- [18] Zou T, Kang R, Tan P, 2021, The Role Crisis and the Reshaping of Teachers in the Era of Artificial Intelligence. *Contemporary Educational Science*, (06): 88–95.
- [19] Wang T, Cai W, 2022, From General Practice Vision to General Practice Thinking: The Professional Development Characteristics of Outstanding Teachers in General Practice. *Journal of Chongqing Open University*, 34(06): 41–49.
- [20] Huang F, 2003, *New Curriculum Reform Research Series: Teacher Role and Teacher Training in the New Curriculum*, People's Education Press, Beijing, 50.
- [21] Xu H, Dong Z, 2012, On the Necessity of Studying the Role Adaptation of College Teachers. *University Education Management*, 6(01): 34–38 + 43.

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Research on the Integration Path of Ideological and Political Education in the Design Thinking and Expression Course

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Abstract: This study explores the integration path of ideological and political education in the course Design Thinking and Expression of environmental art design, aiming to enhance students' innovative thinking, social responsibility, and awareness of sustainable development. Based on the core philosophy of design thinking (people-oriented, problem-solving, and interdisciplinary collaboration) and the elements of ideological and political education in courses (moral education, cultural confidence, sustainable development, and social equity), the study proposes implementation paths for optimizing course objectives, adjusting course content, innovating teaching methods, and optimizing the evaluation system. Through project-based learning, situational teaching, and interdisciplinary collaboration, combined with practical cases such as historical district renewal, environmental design for rural revitalization, and green commercial space design, it has been verified that the effective integration of ideological and political elements in courses can enhance students' cultural identity, sense of social responsibility, and design innovation ability. This study provides theoretical support and practical demonstration for the ideological and political reform of environmental art design courses. In the future, interdisciplinary collaboration can be further deepened, social practice applications can be expanded, the evaluation system can be improved, and the systematic development of ideological and political courses can be promoted.

Keywords: Ideological and political education; Design Thinking and Expression course; Integration path

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1. Introduction

1.1. Research background

In recent years, China has deepened the ideological and political construction of courses in the field of higher education, emphasizing the organic integration of professional education and ideological and political education to achieve the fundamental task of "cultivating morality and fostering talents." In 2016, the *Opinions on*

Strengthening and Improving Ideological and Political Work in Colleges and Universities Under the New Situation issued by the State Council clearly stated that the educational role of various courses should be fully utilized, and professional courses should integrate socialist core values, excellent traditional Chinese culture, ecological civilization construction, and other content, so that ideological and political education runs through the entire process of talent cultivation ^[1]. In 2020, the Ministry of Education further issued the *Guiding Outline for the Construction of Ideological and Political Courses in Colleges and Universities*, proposing that the construction of ideological and political courses should combine the characteristics of disciplines to enhance students' social responsibility, humanistic literacy, and innovative spirit ^[2]. In this context, as an important discipline connecting society, culture, and ecological environment, the teaching content and training objectives of environmental art design major urgently need to adapt to the needs of social development. However, the current environmental art design education still has the problem of emphasizing skills over values and form over substance. Some courses do not pay enough attention to issues such as social responsibility, cultural identity, and sustainable development. This leads to a lack of sensitivity to social issues and consideration of design ethics while cultivating students' innovative abilities. Therefore, how to effectively integrate ideological and political elements into environmental art design teaching to achieve the comprehensive educational goal of design education has become an important topic in higher education reform.

1.2. Research purpose and significance

With the advancement of higher education reform, how to effectively integrate ideological and political elements into professional courses, so that students can establish correct values, enhance social responsibility, and promote humanistic care while mastering professional knowledge and skills, has become an important issue. The environmental art design major not only needs to cultivate design talents with innovative thinking but also should guide students to pay attention to social realities such as ecological sustainable development, historical and cultural protection, social equity, and coordinated urban and rural development. This study aims to explore the integration path of ideological and political education in the Design Thinking and Expression course, to enhance students' innovation ability and sense of social responsibility, mainly involving the following aspects: (1) Course objective optimization: Integrating social responsibility, cultural identity, and the concept of sustainable development on the basis of knowledge imparting and skill cultivation. (2) Course content adjustment: Designing practical tasks in combination with social issues, guiding students to pay attention to cultural, ecological, and social issues. (3) Teaching method innovation: Adopting project-based learning (PBL), situational teaching, interdisciplinary collaboration, and other methods to enhance the ideological and political education function of the course. (4) Evaluation system optimization: Adding indicators such as cultural value, social responsibility, and sustainability to the traditional design evaluation system to improve the diversity and comprehensiveness of evaluation. This study has certain theoretical value to provide support for the ideological and political construction of environmental art design courses. It also has practical significance in promoting the upgrading of talent training models, encouraging students to solve real problems with design thinking, and enhancing their sense of social responsibility and innovative practical ability. At the same time, the research results can provide examples of ideological and political implementation for other practical disciplines, helping colleges and universities achieve the goal of "cultivating morality and fostering talents."

2. Theoretical basis

In the context of contemporary higher education reform, Design Thinking, as an innovative problem-solving approach, plays an increasingly important role in environmental art design teaching. Meanwhile, the advancement of ideological and political courses requires that professional courses strengthen value guidance while imparting knowledge and skills, cultivating students' social responsibility, cultural identity, and awareness of sustainable development. The two have a high degree of agreement in educational goals, teaching methods, and practical paths, which can promote each other and jointly enhance the educational value of environmental art and design courses.

2.1. Core concept of Design Thinking

Design Thinking is a user-centered, interdisciplinary collaboration and innovation practice-oriented way of thinking, widely used in spatial planning, landscape design, and indoor environment optimization in the field of environmental art design. Its core philosophy mainly includes Empathy, Define, Ideate, Prototype, and Test & Iterate. These core concepts of Design Thinking not only promote innovative practices in environmental art design but also provide methodological support for the effective integration of ideological and political courses, enabling students to enhance their sense of social responsibility and form design concepts that meet social needs in the process of solving real problems.

2.2. Core elements of ideological and political courses

As an important teaching reform direction in higher education, ideological and political courses emphasize integrating ideological and political education into professional courses, achieving an organic combination of knowledge imparting, ability cultivation, and value shaping^[3]. In environmental art design courses, the core elements of ideological and political courses are mainly reflected in several aspects such as cultivating morality and fostering talents, cultural confidence, sustainable development, and social equity. These core elements of ideological and political courses not only enhance the comprehensive educational function of environmental art design education but also provide a clear value orientation for the teaching practice of Design Thinking. Through the integration of ideological and political education, environmental art design courses can transcend the traditional skill training mode and cultivate design talents who are more concerned with social needs, cultural consciousness, and ecological responsibility.

2.3. The convergence of Design Thinking and ideological and political courses

Design Thinking and ideological and political courses have a high degree of agreement in goals, methods, and practical paths. Their integration can not only improve the teaching quality of environmental art design courses but also more effectively guide students to form correct values in practice. The convergence of the two is mainly reflected in the following aspects:

- (1) Consistent people-oriented philosophy: Design Thinking emphasizes user experience and social needs, while ideological and political courses focus on people's comprehensive development and social responsibility. Both emphasize people as the core and achieve a positive response to social issues through design.
- (2) Problem-oriented education model: The "problem definition" aspect of Design Thinking requires students to identify and analyze social issues, such as ecological environmental protection, urban renewal, and rural revitalization, which highly aligns with the focus of ideological and political courses on social responsibility and practical issues.

- (3) Innovation-driven practical methods: Design Thinking emphasizes innovative solutions, while ideological and political courses encourage the integration of socially responsible innovation in professional education. The combination of the two helps cultivate compound talents with both innovative spirit and social responsibility awareness ^[4].
- (4) Interdisciplinary collaboration teaching method: The implementation of Design Thinking often requires combining sociology, ecology, psychology, engineering technology, and other disciplines. Similarly, ideological and political courses need interdisciplinary integration to help students more comprehensively understand the social value and ethical considerations of design.

Through the practice-oriented approach of Design Thinking, ideological and political courses can be more deeply integrated into environmental art and design courses. This enables students to spontaneously develop concerns about social issues in teaching links such as project practice, social research, and interdisciplinary collaboration. As a result, they can embody humanistic care, social responsibility, and the concept of sustainable development in the actual design process.

3. Implementation paths of ideological and political education in courses

3.1. Course objective optimization

Traditional environmental art and design education often focuses on aesthetic expression and technical practice, with less involvement in deep values such as social responsibility, cultural identity, and ecological sustainability. To meet the requirements of ideological and political construction in the new era, course objectives should shift from pure skill cultivation to social value guidance, building a teaching system that integrates professional ability, innovative thinking, and social responsibility. By optimizing course objectives, students can enhance their cognition of social equity, cultural inheritance, and ecological sustainability while mastering design methods and expression skills, prompting them to reflect on the social value of design in practice.

3.2. Ideological and political integration into course content

To effectively integrate ideological and political education into the Design Thinking and Expression course, it is necessary to strengthen social issues in content settings, enabling students to enhance cultural confidence, environmental awareness, and social responsibility while learning professional knowledge ^[5].

- (1) Combination of traditional culture and modern design: Through cases such as intangible cultural heritage crafts, local cultural elements, and historical building preservation, students can inherit and innovate local culture in their designs, enhancing cultural identity.
- (2) Green design and sustainable development: Concepts like low-carbon design, eco-friendly building materials, and sustainable city planning are emphasized, guiding students to focus on the environmental impact of design and cultivating awareness of sustainable development.
- (3) Social equity and spatial optimization: Through practices like accessible design, aging-friendly community renovations, and urban-rural public space optimization, students are guided to consider how design can promote social equity and inclusive development.

3.3. Teaching method innovation

To achieve effective integration of ideological and political education in courses, innovative teaching methods are needed, enabling students to deeply understand social issues, cultural values, and ecological sustainability

during the practical process, and form a design thinking that meets social needs.

- (1) Project-based learning (PBL): Combining social realities such as rural revitalization, community renovation, and cultural heritage preservation, students are organized to conduct project research based on real cases, enhancing their social responsibility in the process of solving practical problems.
- (2) Situational teaching: Through teaching methods like case simulations, social surveys, and role-playing, students experience social realities, guiding them to incorporate humanistic care and social value considerations into the design process.
- (3) Interdisciplinary cooperation: Integrating with disciplines like sociology, ecology, psychology, and management, students' horizons are broadened, enabling them to form a more comprehensive understanding of aspects such as spatial design, cultural research, and user experience analysis, improving the social adaptability of design proposals.

3.4. Evaluation system optimization

The traditional evaluation system for environmental art and design courses mainly focuses on the innovativeness, technical performance, and visual aesthetics of the works, with less emphasis on social value and cultural impact. To further enhance the teaching effectiveness of ideological and political education in courses, a multi-dimensional evaluation system needs to be constructed, covering the following aspects:

- (1) Cultural inheritance: Evaluating students' innovative use of traditional cultural elements and regional characteristics in their designs ^[6].
- (2) Social responsibility: Examining whether the design proposals focus on social equity, public welfare, and social needs, and measuring their social contribution.
- (3) Ecological sustainability: Analyzing the impact of design works on environmental friendliness, resource conservation, and sustainable development to ensure that designs align with environmental protection principles.
- (4) User feedback and social impact: Combining feedback from community residents, industry experts, and users to evaluate the social adaptability and user recognition of design proposals, enhancing the practical orientation of teaching evaluation.

4. Case analysis of ideological and political practice in courses

In the Design Thinking and Expression course, the effective integration of ideological and political education is not only reflected in theoretical teaching but also needs to be strengthened through practical cases. The following select actual cases focusing on cultural inheritance, social responsibility, and sustainable development to explore how to enhance students' humanistic literacy, social responsibility awareness, and ecological sustainability concepts through project practice, achieving deep integration of ideological and political education in the course.

4.1. Historical district renewal design: Cultural inheritance orientation

This case aims to combine traditional culture protection with modern design innovation, cultivating students' cultural identity and design innovation abilities. Through research on historical districts, traditional buildings, and intangible cultural heritage spaces, students need to optimize spatial functions, enhance cultural experiences, and increase public participation while preserving historical textures. During the design process, students must not only focus on restoration strategies for historical buildings but also adapt traditional culture to contemporary

social needs in line with modern lifestyles. This project helps cultivate students' awareness of respecting cultural diversity and guides them to practice cultural confidence and inheritance innovation in environmental design.

4.2. Rural revitalization environmental design: Social responsibility orientation

This case is set in the context of the rural revitalization strategy, focusing on the issue of uneven development between urban and rural areas, and encouraging students to contribute to rural revitalization through environmental design^[7]. The project selects actual rural spaces, such as public activity areas, village landscapes, and traditional house renovations, requiring students to propose feasible design solutions that meet rural development needs while respecting the local ecological environment and social culture. Through interaction with local residents, governments, and related institutions, students can deeply understand social issues such as rural spatial optimization, agricultural landscape protection, and community vitality enhancement, enhancing their sense of social responsibility and public service awareness in project practice.

4.3. Green commercial space design: Sustainable development orientation

This case focuses on the integration of green design and commercial spaces, aiming to guide students to practice sustainable development concepts in shaping the business environment. Students need to design commercial spaces that meet the requirements of environmental friendliness, resource conservation, and sustainable operations, centering on elements such as low-carbon building materials, energy-saving technologies, and green spatial layouts. The project requires students to explore how to achieve a balance between environmental and economic benefits in commercial spaces using strategies like ecological building design, smart environmental protection technologies, and recyclable materials. Through practice, students can deeply understand the application value of sustainable development concepts in design and cultivate their awareness of actively practicing green design in their future careers.

5. Research conclusion and prospects

5.1. Conclusion

This study explored the integration of ideological and political education into the curriculum of environmental art design courses through design thinking, and analyzed its educational value through practical cases. The research indicates that design thinking, as a people-oriented, problem-solving, and interdisciplinary collaborative innovation method, highly aligns with the core philosophy of ideological and political education in the curriculum, effectively promoting the teaching reform of environmental art design courses. By incorporating ideological and political elements such as cultural inheritance, social responsibility, and sustainable development into the Design Thinking and Expression course, students not only enhance their innovative thinking and design expression abilities but also strengthen their sense of social responsibility, humanistic care, and awareness of sustainable development^[8].

Furthermore, the introduction of ideological and political education in the curriculum expands the social value orientation of design education, making environmental art design focus not only on aesthetic expression and technological innovation but also on social equity, cultural identity, and ecological sustainability. Through project-based teaching, situational simulations, and interdisciplinary integration, students develop a more comprehensive design thinking in practice and cultivate a design methodology with a stronger sense of social responsibility. Therefore, the deep integration of ideological and political education not only improves teaching quality but also pushes environmental art design education toward a more diversified, socialized, and human-

oriented direction.

5.2. Prospects

Despite this study proposing implementation strategies for the integration of ideological and political education and design thinking, there is still room for further optimization in practical teaching. Future research can explore the following aspects:

- (1) Deepening interdisciplinary collaboration and expanding the teaching mode of ideological and political education in the curriculum: Design thinking is essentially an interdisciplinary methodology. In the future, it is necessary to strengthen the integration of environmental art design with sociology, ecology, psychology, and other disciplines, making the implementation of ideological and political education in the curriculum more multidimensional and systematic. Through interdisciplinary cooperation, course content, teaching methods, and practical applications can be further expanded, providing students with a broader design perspective.
- (2) Enhancing social practice and increasing the social impact of design proposals: The ultimate goal of ideological and political education in the curriculum is to cultivate design talents with a sense of social responsibility. Therefore, future teaching should further strengthen the teaching mode combined with social practice, such as school-enterprise cooperation, social research, and public welfare design projects, to enhance students' social participation. Simultaneously, a platform for industry-university-research integration should be established to encourage students to connect course learning with actual social needs, making design proposals more realistic and socially influential.
- (3) Constructing a scientific evaluation system for ideological and political education in the curriculum: Currently, the effectiveness evaluation of ideological and political education in the curriculum still mainly relies on traditional work displays and theoretical assessments. In the future, a more comprehensive and practice-oriented evaluation system should be explored. Methods such as social feedback mechanisms, project impact assessments, and user experience surveys can be introduced to establish a diversified evaluation system that better aligns with the goals of ideological and political education in the curriculum, more scientifically measuring students' growth and the effectiveness of ideological and political education in the curriculum.

In summary, future environmental art design education should continue to explore the deep integration path of ideological and political education and design thinking in the curriculum, promoting the optimization of teaching modes, practical applications, and evaluation systems, laying a more solid foundation for cultivating innovative and socially responsible design talents.

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References

- [1] Wang Y, Zhao D, Feng Z, 2018, Exploring the Path of Ideological and Political Education to Facilitate Innovation and Entrepreneurship Education for College Students. *China Market*, (03): 216–217.
- [2] Zhou Y, 2022, Research on the Selection of Scientific Literacy Texts in Unified Edition High School Chinese Textbooks, dissertation, Guangxi Normal University.
- [3] Wang L, 2022, Analysis of the Teaching Elements and Mechanisms of “Curriculum Ideology and Politics” Based on Cultivating Morality and Talent. *Modern Vocational Education*, (18): 7–9.
- [4] Wen N, 2018, Research on the Integration of Entrepreneurship Education and Professional Education in Rail Transit Engineering Technology Major. *Science and Technology Venture Monthly*, 31(03): 88–90.
- [5] Zhao G, 2023, Teaching Exploration and Practice of Programming Courses in the Context of Ideological and Political Education. *Journal of Hubei Engineering University*, 43(03): 27–30.
- [6] Hou L, Liu H, 2024, Research on the Evaluation of Ideological and Political Assessment in Xinjiang Vocational Art Design Courses. *Wisdom*, (12): 61–64.
- [7] Liu S, Ye Z, 2021, Practical Analysis of College Students’ Assistance to the Rural Revitalization Strategy. *Rural Technology*, 12(19): 20–22.
- [8] He W, Shu Q, Zhang Y, et al., 2017, Innovation and Exploration of Community Practice Teaching Mode for Chinese Medicine Students. *Chinese Medicine Education*, 36(05): 21–23.

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The Double-Edged Sword of Artificial Intelligence: Ethics and Privacy Protection in Future Exams

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Abstract: The widespread application of artificial intelligence (AI) technology in exams has significantly improved the efficiency and fairness of exams; it has also brought challenges of ethics and privacy protection. The article analyzes the fairness, transparency, and privacy protection issues caused by AI in exams and proposes strategic solutions. This article aims to provide guidance for the rational application of AI technology in exams, ensuring a balance between technological progress and ethical protection by strengthening laws and regulations, enhancing technological transparency, strengthening candidates' privacy rights, and improving the management measures of educational examination institutions.

Keywords: Artificial intelligence; Examination; Ethics; Privacy protection

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1. Introduction

Artificial intelligence (AI) technology is profoundly changing the field of education, especially in exam management, where the application of AI technology has improved efficiency and fairness. However, the rapid development of technology has also brought ethical and privacy challenges, such as algorithmic bias, insufficient decision transparency, and privacy risks for candidates. The article aims to discuss these issues and propose specific strategies to balance technological progress and candidates' right protection, to provide reference for educational examination institutions.

2. Current application status of AI in exams

2.1. Intelligent paper marking inspection assistance and automatic test question generation

The application of intelligent paper marking inspection assistance significantly improves the overall quality of grading and reduces the possibility of human errors. However, the accuracy and fairness of this technology

still receive much attention. Although AI can achieve efficient grading through big data analysis and pattern recognition, it cannot completely replace the judgment and experience of human examiners when dealing with complex subjective questions. In addition, biases and imbalanced training data that may exist in algorithms may also lead to unfairness in the grading results. Therefore, how to ensure fairness and impartiality in the grading results while improving efficiency remains an urgent problem to be solved.

In terms of intelligent question generation, AI systems can generate adaptive exam questions based on the candidate's knowledge level and exam targets. The application of this technology makes the exam content more personalized and diversified, breaking the limitations of the traditional question-setting mode. However, it is still faced with challenges on how to ensure exam fairness. If AI-generated test questions fail to consider the background differences of candidates, it may lead to biased exam results, thereby affecting the fairness of the exam^[1]. Therefore, when developing and using intelligent question systems, it is necessary to fully consider the adaptability and fairness to avoid exam unfairness caused by technology.

2.2. Candidate behavior analysis and cheating detection

The introduction of AI invigilation systems provides a new means to combat exam cheating. Through real-time monitoring and analysis of candidate behavior, AI systems can quickly identify abnormal behavior, which greatly improves the fairness and security of exams. However, the widespread application of AI proctoring systems also comes with potential risks. Candidates are monitored throughout the exam process, which may raise concerns about their privacy rights. Meanwhile, the misjudgment or technical malfunction of AI systems may also lead to innocent candidates being identified for cheating, thereby affecting their exam scores and personal reputation.

The collection and analysis of candidate data is the foundation for the effective operation of AI invigilation systems, but it also brings serious ethical issues. A large amount of personal data faces the risk of data leakage and abuse during collection, storage, and analysis^[2]. Do candidates have the right to know the specific use of their data? How do we find a balance between technological development and personal privacy protection? These issues still need to be explored and resolved in practice.

2.3. Application practice of Education Examination Institute

As an important institution for exam management, the Education Examination Institute has introduced AI technology to a certain extent to improve the efficiency and quality of exam management. For example, some provinces have attempted to apply intelligent marking to assist quality inspection in large-scale exams such as the college entrance examination, middle school entrance examination, and academic examination, in order to improve the quality of marking and ensure consistency in grading. At the same time, some regions are also exploring the application of intelligent question systems to achieve more scientific and fair exam evaluation. However, the application of these technologies also poses higher requirements for the management capabilities and policy-making of educational examination institutions.

Regarding the application of AI in exams, the Education Examination Institute needs to develop and improve relevant policies and management measures to ensure the compliance and rationality of technology applications, which includes establishing and improving data protection mechanisms, strengthening the evaluation and supervision of AI systems, and fully considering the rights and privacy protection of candidates in technological applications. The Education Examination Institute also needs to actively engage in social communication to enhance public understanding and trust in the application of AI technology in exams and seek

the best balance between technological innovation and ethical protection.

3. Ethical issues caused by AI in exams

3.1. Fairness and prejudice

The design and training process of AI algorithms relies on large-scale datasets, and the imbalance and bias in these datasets may lead to unfair results in the application of AI systems. Specifically, AI algorithms may tend to favor a specific group during grading, question setting, and other processes, leading to the unfair treatment of some candidates. For example, the cultural background or language habits of certain groups may not be fully reflected in the algorithm training data, which may lead to poor performance of AI systems while processing exam answers from such candidates. To ensure the fairness of the exam, measures must be taken to identify and eliminate biases in AI algorithms, ensuring that candidates from different groups have equal opportunities in the exam. This requires full consideration of social diversity in algorithm design, dataset selection, and system testing processes, and multi-party review mechanism must be taken to monitor the fairness of AI systems^[3].

3.2. Transparency and interpretability of decision-making

The “black box” problem in the AI decision-making process is a major challenge in current technological applications. Due to the complexity of AI algorithms, the decision-making process often lacks transparency and is difficult for non-technical personnel to understand and explain. In the examination environment, candidates, parents, and teachers may know very little about how AI systems make scoring or judgment results, which may lead to trust crises due to a lack of transparency. Lack of clear explanation path when candidates question AI decisions will lead to distrust and dissatisfaction with exam results. Therefore, the Education Examination Institute needs to ensure the transparency of the AI system and guarantee the candidates’ right to know and appeal by publicly disclosing algorithm decision-making logic and setting up result interpretation mechanisms. Further technological development should move toward interpretable AI, making the decision-making process more transparent and fair, thereby enhancing public trust in AI technology.

3.3. Psychological pressure and trust of candidates

The widespread application of AI invigilation systems in the examination has had an undeniable impact on the psychological state of candidates. Under highly intelligent monitoring, candidates may feel nervous and anxious, worrying that every action they make will be misjudged as abnormal behavior by the system. This psychological pressure may not only affect exam performance, but also have a negative impact on candidates’ physical and mental health. Another serious issue involves candidates’ trust in AI systems. If there is a misjudgment or improper operation of the AI system, candidates’ trust in its impartiality will be greatly reduced, thereby questioning the reliability of the entire examination system.

To alleviate the psychological pressure on candidates, educational examination institutions should make the design and application of AI invigilation systems more user-friendly, avoiding excessive reliance on technological means for monitoring. At the same time, it enhances candidates’ understanding and trust in AI systems through education and communication. A transparent and fair error correction mechanism should be established for any misjudgment or abnormal handling of AI systems to ensure the legitimate rights and interests of candidates.

4. Privacy protection challenge of AI in exams

4.1. Data collection and storage

The effective application of AI technology relies on the collection of a large amount of candidate data. However, the scope and legality of collecting the personal data of candidates have attracted widespread attention. During the exam process, the identity information, behavioral data, and even biometric data of candidates may be comprehensively collected. Once these data are abused or leaked, they will pose a serious threat to the personal privacy of candidates. Therefore, the scope of data collection should strictly follow the principle of minimization, that is, only collect necessary data directly related to the exam. At the same time, it is necessary to ensure the legality of the data collection process and fully respect the candidates' right to know and consent.

In terms of data storage, security and access control are the core issues to ensure the privacy of candidates. Due to the sensitivity of candidate data, a data breach will have a widespread negative impact on candidates and society. Therefore, data storage should adopt advanced encryption technology and strictly limit access permissions, only authorizing relevant personnel to access under specific circumstances. In addition, regular security reviews and upgrades of storage systems are necessary to address constantly changing network security threats.

4.2. Data usage and sharing

The purpose and scope of candidate data use is also an important issue in privacy protection. The diversity of AI technology applications makes it possible for candidate data to be used for various purposes, such as exam score evaluation, behavior analysis, educational resource recommendation, etc. However, in the process of using data, it is necessary to clarify the scope of data use, ensure that it is limited to legal and necessary purposes, and avoid infringing on the privacy rights of candidates due to data abuse. In addition, strict auditing and supervision mechanisms should be established to ensure transparency and compliance in the data usage process.

In terms of data sharing, privacy risks and legal responsibilities are particularly prominent. Candidate data may be shared or exchanged by different institutions, such as education departments, research institutions, or third-party technology companies. During this process, the privacy risks of data sharing need to be highly vigilant, especially in the case of insufficient data anonymization and anonymization processing, where the privacy of candidates may still be threatened. At the same time, the issue of legal responsibility in data sharing cannot be ignored. All parties should clarify their responsibilities when sharing data, ensure that data sharing complies with relevant laws and regulations, and be responsible for the privacy of candidates.

4.3. Privacy protection measures of the Education Examination Institute

As an important institution for exam management, the role of the Education Examination Institute in privacy protection is crucial. Currently, the Education Examination Institute has implemented a series of privacy protection policies to a certain extent, including technical means such as data encryption, access control, and data anonymization. However, with the continuous development of AI technology, existing privacy protection measures still have certain loopholes. For example, problems such as insufficient policy implementation, untimely technological updates, and inadequate protection of candidates' right to know and participate in privacy protection still exist.

To address these challenges, the Education Examination Institute needs to further improve its privacy protection policies and take proactive improvement measures. Firstly, the enforcement of privacy protection policies should be strengthened to ensure that all measures are effectively implemented in practice. Secondly, it is necessary to regularly evaluate and update privacy protection technologies to ensure that they can respond to

emerging security threats. In addition, the Education Examination Institute should strengthen communication with candidates to increase policy transparency and ensure that candidates have sufficient right to know and participate in their own data processing process, thus achieving a balance between technology application and privacy protection.

5. Strategies for balancing technological progress and ethical privacy protection

5.1. Strengthening the formulation of laws, regulations, and policies

Currently, the application of AI technology in exams has not yet formed a systematic legal norm, and this legal vacuum makes it difficult to effectively address many potential ethical and privacy issues. Therefore, it is urgent to develop and improve a legal framework for the application of AI in exams, clarifying the boundaries and responsibilities of technology use.

Firstly, legislation should be passed to clarify the legality and scope of the application of AI in exams. The law should provide specific requirements for data collection, use, storage, and sharing to ensure the security and privacy of candidates' personal information is not violated. In addition, in response to the bias and injustice that AI technology may bring, the law should clarify the standards for algorithm transparency and fairness and provide corresponding regulatory and error correction mechanisms to prevent the abuse of technology from harming the rights and interests of candidates. In the specific process of formulating the legal framework, it is necessary to widely solicit opinions from various parties, including technical experts, educators, legal scholars, and the public, to ensure the scientificity, rationality, and operability of legislation. In addition, punishment measures for the illegal use of AI technology should be clearly defined in the law to form an effective legal deterrent and prevent potential risks and improper behavior.

As the core institution of examination management, the Education Examination Institute plays an important role and responsibility in policy-making. The Education Examination Institute should first actively participate in the legislative process at the national and local levels, provide professional opinions and technical support, and ensure that the formulation of laws and regulations meets the actual needs and development trends of examination management. On this basis, the Education Examination Institute needs to develop and implement internal policies and operational norms that are compatible with the legal framework to ensure the reasonable use of AI technology in exams. These policies should cover the selection criteria for AI systems, data management standards, invigilation measures, and emergency response plans, ensuring that the rights and interests of candidates can be effectively protected in any situation. In addition, the Education Examination Institute also needs to bear the responsibility of supervision and evaluation in policy formulation. To this end, a comprehensive evaluation mechanism should be established to regularly review the application effectiveness and potential problems of AI technology and adjust policies and measures in a timely manner based on the evaluation results. The Education Examination Institute should also establish communication channels with candidates and various sectors of society, enhance the transparency and credibility of policies, and ensure that the implementation of various measures can truly safeguard the legitimate rights and interests of candidates ^[4].

5.2. Enhancing technological transparency and fairness

Ensuring transparency and fairness in the integration of artificial intelligence technology into exam management has become a crucial issue. The transparency and fairness of AI algorithms directly affect the credibility and social recognition of exam results. Therefore, developing transparent and fair AI algorithms, as well as introducing multi-party supervision and evaluation mechanisms, are urgent issues that need to be addressed ^[5].

The transparency of AI algorithms is one of the core issues in the application of technology in exams. Due to the fact that AI systems often rely on complex mathematical models and data analysis, the decision-making process is often difficult for ordinary users to understand. This “black box” effect makes it difficult for candidates, parents, and educators to trust the fairness of AI scoring. Therefore, developing transparent AI algorithms to ensure the interpretability of the decision-making process is the key to solving this problem. Specifically, in the design and development stages of AI systems, the interpretability of algorithms should be fully considered, so that they can not only provide results, but also explain the logic and basis behind scores or judgments. This transparency can be achieved through open algorithm design, open testing standards, and the provision of visualization of algorithm decision-making processes. In addition, the fairness of AI algorithms is an important foundation for ensuring exam fairness. In the process of algorithm development, diverse datasets should be widely collected and used to avoid decision bias caused by data bias. Developers need to establish strict testing and validation procedures, conduct sufficient fairness checks on algorithms, and ensure that they treat candidates of different genders, races, cultural backgrounds, and other groups equally. At the same time, ethical review mechanisms should be introduced in algorithm design to identify and correct potential biases and injustices, thereby ensuring the fairness of the algorithm in practical applications.

Ensuring the transparency and fairness of AI technology in exams through the efforts of technology developers alone is far from enough. It is necessary to introduce a multi-party supervision and evaluation mechanism to form a pattern of social governance. Specifically, this mechanism should involve the participation of various forces such as government regulatory agencies, educational institutions, technical experts, legal experts, and public representatives. Through multi-party supervision, a comprehensive review of the development and application process of AI systems can be conducted to ensure compliance with fair and transparent ethical standards. At the specific implementation level, a multi-party supervision mechanism can be achieved through regular algorithm reviews, independent third-party evaluations, and public hearings. The Education Examination Institute can regularly invite external experts and public representatives to independently evaluate AI systems and make the evaluation results public to enhance transparency.

5.3. Strengthening the protection of candidates’ privacy rights

In the widespread application of AI technology in the examination process, the privacy rights of candidates are facing unprecedented challenges. Ensuring that the privacy rights of candidates are not infringed upon in this emerging technological environment is the key to maintaining educational fairness and social trust. To this end, it is necessary to effectively enhance candidates’ control over personal data and establish a sound data protection and complaint mechanism to safeguard their privacy rights.

In AI-driven exam management systems, candidates’ personal data becomes a critical resource. However, current technological applications often rely on extensive data collection, and candidates have relatively weak control over this data. To safeguard the right to privacy, it is necessary to increase candidates’ control over their personal data, ensuring that candidates have sufficient informed and decision-making power in all aspects of data collection, use, and storage. Firstly, the scope and purpose of collecting candidate data should be clearly defined, and a detailed disclosure procedure should be implemented before data collection to ensure that candidates are aware of how their data will be used and the potential risks they may face. Candidates should have the right to choose whether to agree to the collection and use of data and may withdraw their consent if necessary. In addition, in the process of data storage and processing, candidates should be provided with channels to access their personal data, enabling them to view, modify, or delete inaccurate or unnecessary data.

At the same time, in order to enhance the control of candidates, it is necessary to develop and apply advanced data management tools. These tools should have intuitive user interfaces, facilitate data management for candidates, and further reduce the risk of data leakage through encryption and anonymization technologies. The Education Examination Institute and related technology providers need to work together to promote the popularization and application of these tools, ensuring that every candidate can effectively protect their privacy rights in the AI technology environment.

It is crucial to establish a sound data protection and complaint mechanism to further strengthen the protection of candidates' privacy rights. The data protection mechanism should include multi-level security measures, covering various aspects such as data collection, transmission, storage, and use. This requires not only technical security measures such as data encryption and access control, but also strict regulatory oversight at the institutional level, such as regular security reviews and legal accountability for unauthorized use. In addition, establishing an effective complaint mechanism is a key means of safeguarding the privacy rights of candidates. When candidates believe that their privacy rights have been violated or have doubts about the data processing process, there should be clear and convenient complaint channels. The Education Examination Institute should establish a dedicated complaint-handling department responsible for receiving and handling privacy complaints from candidates, ensuring that the complaint process is open and transparent and the handling results are fair and reasonable. In the process of handling complaints, it is necessary to promptly respond to candidates' doubts, provide detailed investigation reports, and take remedial measures when necessary to maximize the protection of candidates' legitimate rights and interests.

5.4. Management and supervision measures of the Education Examination Institute

In the process of gradually integrating AI technology into exam management, the Education Examination Institute shoulders the responsibility of ensuring the compliance of technology applications and maintaining exam fairness. Therefore, it is necessary to strengthen internal management and supervision measures and strictly regulate the use of AI technology^[6]. At the same time, regularly evaluating the application effectiveness and potential risks of AI technology in exams can ensure that it does not harm the rights and interests of candidates while improving efficiency^[7].

The Education Examination Institute must establish a strict internal management and supervision system in the application of AI technology to ensure that the application of technology complies with relevant laws, regulations, and ethical norms. Firstly, it is necessary to establish detailed internal policies and operational standards to oversee the entire process of designing, developing, testing, deploying, and using AI systems. These policies should include clear data collection standards, algorithm design requirements, system operation rules, and exception handling procedures to ensure that AI technology is compliant and legal at every step of its application. A multi-level review mechanism should be introduced in the management and supervision process to regularly review and evaluate the application of AI technology. Through internal review, potential violations or technical defects can be identified and corrected in a timely manner. At the same time, the Education Examination Institute should establish a dedicated supervisory agency or position to oversee the daily application of AI technology and ensure that all operations comply with established standards. These supervisory measures not only help prevent technological abuse, but also enhance public trust in the fairness and transparency of AI technology in exams. In addition, the Education Examination Institute needs to strengthen the training and education of internal personnel to enhance their awareness of ethics and privacy protection in the application of AI technology. Through continuous education and training, relevant personnel will have

sufficient knowledge and skills to effectively manage and supervise the operation of AI systems, ensuring that every aspect of technology application complies with ethical and legal requirements.

The application effectiveness and potential risks of AI technology are constantly changing, and educational examination institutions must establish regular evaluation mechanisms to comprehensively examine the performance of AI technology in exams. This evaluation mechanism should cover multiple dimensions, such as technical effectiveness, candidate experience, privacy protection, ethical impact, etc., to ensure that AI technology improves exam management efficiency without adversely affecting the rights and interests of candidates and the fairness of the exam. Specifically, regular evaluations should include checks on the accuracy, fairness, and transparency of AI systems to ensure that they accurately reflect the true level of candidates in practical applications and avoid unfairness caused by algorithm bias or data errors. In addition, attention should be paid to the protection of candidates' privacy by AI technology, and the effectiveness of privacy protection measures should be evaluated by analyzing information such as data leakage incidents and complaint records. Risk assessment is equally important. The Education Examination Institute should identify and prevent potential technical risks such as system failures, data loss, or tampering through simulation tests, emergency drills, and other methods. At the same time, it is imperative to establish a rapid response mechanism that can quickly take remedial measures when risks or problems arise, reducing the impact on candidates and the examination system.

6. Conclusion

The application of AI technology in exam management has great potential, but it also brings ethical and privacy risks. The strategies proposed in the article, including strengthening regulatory development, improving technological transparency, safeguarding privacy rights, and improving management supervision, aim to provide support for the Education Examination Institute to promote technological applications while maintaining the fairness of exams and the rights of candidates. In future development, it is crucial to continue paying attention to these issues in order to achieve sustainable application of AI technology in education.

Disclosure statement

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References

- [1] Cheng W, 2023, Difficulties and Implementation Concepts of Paperless Examination Implementation. *Zhejiang Examination*, (12): 13–16 + 50.
- [2] Chen W, Qi Y, 2023, Integration of Virtual Reality and GPT-based Artificial Intelligence: An Innovative Path for Educational Application Development. *Computer Knowledge and Technology*, 19(34): 129–131.
- [3] Liu B, 2023, Digital Transformation of Data-Driven Teaching: Mechanism, Field, and Path. *Modern Educational Technology*, 33(09): 16–26.
- [4] Sun L, 2023, Reflections on Enhancing the Efficiency of National Education Examination Management. *Zhejiang Examination*, (11): 10–13.
- [5] Zhang M, Xue S, 2023, Common Trends and Construction Focus: Global Observation of Digital Transformation in Education. *China Distance Education*, 43(07): 21–29.
- [6] Lu Z, 2023, Research on the Path and Strategy of Digital Transformation of Provincial Examination Institutions.

Enrollment Examination Research, (03): 61–76.

- [7] Zhou J, 2023, Implementation Path of Smart Examination Service in National Education Examination. Examination Research, 19(05): 81–86.

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Research on the Path of Talent Cultivation Model for New Engineering Disciplines in the Era of Artificial Intelligence

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Abstract: The application of artificial intelligence (AI) in new engineering education can optimize course content and educational methods. AI provides personalized learning paths, adjusts teaching strategies, and improves teaching management through real-time feedback. Despite its potential, challenges remain in balancing technology use with educational philosophies, ensuring fairness, and preventing over-reliance on technology. The integration of AI should focus on fostering critical thinking and problem-solving skills in students. By improving technical literacy and resource allocation, AI can enhance educational efficiency. However, to effectively implement AI, it requires deep integration with educational content, increased policy support, and continued collaboration between industries and academia.

Keywords: Artificial intelligence; New engineering education; Talent cultivation; Educational reform; Policy support

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1. Introduction

In today's era, artificial intelligence (AI), as a key technology driving the Fourth Industrial Revolution, is profoundly changing the way various industries operate, and the education sector is no exception. Particularly in the process of building the new engineering disciplines, the introduction of AI has provided a fresh perspective and methods for reforming talent cultivation models. The new engineering education aims to nurture interdisciplinary, composite talents, and AI is a powerful tool for achieving this goal. Through AI technology, education can become more personalized, efficient, and intelligent, thereby better meeting society's demand for innovative and practical talents^[1].

However, despite the immense potential of AI applications, traditional education systems and talent cultivation models still face numerous challenges. Especially in the field of new engineering disciplines, how to effectively integrate AI technology with traditional educational models and how to improve educational quality while avoiding excessive reliance on technology are critical issues to be addressed. Therefore, this paper aims

to explore the pathways for talent cultivation in the new engineering disciplines in the age of AI, analyze the transformations brought about by AI on educational models, and examine the impact and role of related policies in promoting new engineering education ^[2].

In this context, the application of AI technology not only drives innovation in course content but also enhances educational quality and efficiency through intelligent teaching management and personalized learning path designs. However, balancing the application of technology with the deep integration of educational philosophy and ensuring the fairness and comprehensiveness of education remains a challenge faced by current educational reforms.

2. Impact of AI on talent cultivation in new engineering disciplines

2.1. Transformation of educational methods driven by AI

The rapid development of AI technology has not only transformed industrial production and economic management but has also driven profound changes in the form of education. With the in-depth application of AI technology, traditional “digital” education is gradually transitioning into “intelligent” education. This shift promotes the optimization of educational resources, the personalization of learning methods, and the precision of learning assessments, thereby comprehensively enhancing the quality of education ^[3].

In traditional educational models, teaching content and learning progress are often fixed, neglecting students’ individual differences and needs. AI, on the other hand, can leverage technologies such as big data analysis and machine learning to provide personalized teaching content and learning paths based on students’ learning characteristics and progress. AI systems can analyze students’ learning behaviors in real time, predict learning difficulties, and offer targeted tutoring. This not only enhances teaching efficiency but also increases students’ initiative in learning, promoting the personalization and customization of education ^[4].

Moreover, the application of AI in classroom teaching has also driven changes in teaching methods. Through technologies like virtual reality (VR) and augmented reality (AR), teachers can offer students a more intuitive and interactive learning experience. Particularly in new engineering education, AI can assist students in performing complex experimental operations and engineering simulations, enhancing students’ practical and innovative abilities.

2.2. Challenges in the talent cultivation model for new engineering disciplines

However, the impact of AI on the talent cultivation model for new engineering disciplines is not entirely positive. Despite the immense potential that AI technology offers in education, the existing education system and cultivation models still face significant challenges. First, there is an urgent need to improve teachers’ technical literacy and teaching methods. Although AI can assist in teaching, teachers must possess certain technical abilities and data analysis skills to effectively use AI tools to enhance the teaching process ^[5]. This requires educators to continuously update their knowledge systems, learn new teaching tools and methods, and adapt to the changes brought about by AI.

Second, there is an imbalance in the distribution of educational resources and the popularization of technology. While universities in large cities are gradually taking the lead in applying AI technology, schools in remote areas still face significant challenges in terms of hardware facilities, software resources, and teaching staff. The application of AI requires substantial computing resources and technical support, making the uneven distribution of educational resources one of the bottlenecks restricting the reform of new engineering education.

Furthermore, the introduction of AI may also lead to the issue of “technology dependence” in education.

Some students may become overly reliant on AI tools to complete learning tasks, neglecting the cultivation of independent thinking and creative problem-solving skills. This is a potential risk, especially for new engineering education, which emphasizes innovation and practice in engineering disciplines. Therefore, while promoting the application of AI, finding a balance between technological dependence and independent learning, as well as using AI to foster students' critical thinking and problem-solving abilities, remains a critical issue to be addressed.

3. Pathways for empowering new engineering education reform with AI

3.1. Deep integration of AI with educational content

In the educational system of new engineering disciplines, the introduction of AI can not only optimize course content but also drive the transformation of educational methods. New engineering programs typically involve the integration of multiple disciplines, and AI is a key tool for breaking down disciplinary barriers and promoting interdisciplinary knowledge integration. Through AI, teaching content can be dynamically adjusted according to industry demands, ensuring that course materials and specialized knowledge keep pace with the times. For example, AI can analyze industry development trends and update teaching content in real time, ensuring that students are learning the latest industry technologies and knowledge, thereby cultivating their ability to adapt to rapid changes.

Specifically, AI technology can assist teachers in providing customized learning paths for students by analyzing their interests, learning progress, and challenges through machine learning models. Teaching strategies can be adjusted accordingly to ensure that each student learns efficiently on the most suitable learning path. This personalized teaching approach not only improves students' learning efficiency but also maximizes each student's potential, fostering their innovation abilities and critical thinking.

At the same time, AI can introduce more efficient experimental and practical teaching into new engineering courses. Through virtual simulation technologies, students can perform complex engineering experiments without the constraints of actual hardware conditions. This simulated environment provides more opportunities for experimentation, cultivating students' hands-on abilities and problem-solving skills.

3.2. Enhancing teaching efficiency and personalized learning

AI can effectively enhance teaching efficiency through automation technology, especially in areas such as teaching management and assessment feedback. Traditional teaching assessments often rely on manual processes, resulting in long feedback cycles and being susceptible to subjective factors. AI technology, on the other hand, can collect and analyze students' learning data in real time, providing timely feedback through intelligent analysis. For example, AI systems can automatically grade assignments after students complete them and offer targeted suggestions for improvement, helping students quickly understand their learning status.

More importantly, AI can provide personalized learning recommendations based on students' individual learning characteristics. This means that AI can dynamically adjust learning content and difficulty during the teaching process based on each student's progress and needs, ensuring that students stay motivated and engaged with appropriate challenges. This personalized learning approach not only enhances students' autonomous learning capabilities but also helps them overcome learning bottlenecks inherent in traditional educational models.

Moreover, AI can innovate teaching methods within courses. For example, intelligent education platforms can recommend suitable learning resources, such as reading materials, supplementary videos, case studies, etc.,

based on students' historical learning data, further improving students' learning efficiency.

3.3. Deepening industry-academia-research collaboration

A key goal of new engineering education is to cultivate interdisciplinary talents who can adapt to industry needs. The introduction of AI provides more possibilities for collaboration between schools and enterprises. By establishing industry-academia collaboration platforms, schools can integrate the latest industry demands and technological development trends with course content, ensuring that students are exposed to real-world industry problems and solutions during their learning process.

The rapid development of AI technology has expanded educational models beyond traditional classroom teaching. Schools can collaborate with businesses to design project-based teaching and internships, allowing students to participate in real engineering projects and develop their professional skills while solving problems. The application of AI in enterprises provides students with more authentic and diverse practical opportunities, which is crucial for cultivating students' innovative spirit and practical abilities.

Through in-depth industry-academia-research collaboration, schools can not only improve the quality of teaching but also help students integrate better into society and the industry, enhancing their employability. Additionally, AI technology, through enterprise involvement, can promote the sharing of teaching resources, enabling students to receive a more comprehensive education in a diverse learning environment.

4. Policy support and development trends in empowering education with AI

4.1. Educational intelligence under policy support

In recent years, with the rapid development of AI technology, the Chinese government has introduced a series of policies to promote the application and popularization of AI in the education sector. In particular, the Ministry of Education's policies in "new engineering" construction and AI innovation applications have provided essential policy support for higher education reform. For example, the Ministry of Education's "AI Innovation Action Plan for Higher Education" clearly proposes the promotion of the deep integration of AI technology with education, optimizing talent cultivation programs, and enhancing the intelligence level of higher education.

Under this policy support, more and more universities are integrating AI technology, building intelligent teaching, management, and service systems. The application of AI not only changes traditional teaching methods but also improves the configuration and management of educational resources, promoting the construction of smart campuses. Through the combination of big data and AI, schools can achieve precise teaching assessments and resource allocation, thereby improving educational quality and management efficiency.

At the same time, the policy push has also encouraged the deep integration of industry-academia-research collaboration. The government encourages universities to collaborate with enterprises on AI-related research projects, cultivating interdisciplinary talents that meet market demands. This collaboration model closely aligns the educational system with industry needs, enhancing students' employability and promoting the practical application of AI technologies in education.

4.2. Future development trends and challenges

As AI technology continues to evolve, the talent cultivation model in new engineering disciplines will become more intelligent and personalized. The application of AI will extend beyond teaching to encompass education management, assessment feedback, and educational services. This development trend means that higher education will usher in more intelligent and flexible teaching management models, providing students with a

more diverse learning experience.

However, despite the enormous development potential that AI brings to education, there are still many challenges. First, the scope and depth of technological application vary across regions, particularly in remote areas where a lack of educational resources and technological infrastructure has caused delays in the intelligent transformation of education. Moreover, both teachers' and students' technical literacy needs to be improved. How to effectively train teachers to use AI tools and enhance students' self-directed learning abilities remain key challenges to address.

In the future, AI will play an increasingly important role in education, especially in the cultivation of interdisciplinary, composite talents. AI will foster the integration and application of knowledge across different disciplines, promoting the overall enhancement of students' innovation capabilities. However, balancing the guidance of technology with educational philosophies and ensuring that technological applications do not lead to over-dependence, while preserving the humanistic spirit of education and fostering innovative thinking, will be the focal points of future higher education reform.

4.3. Further improvement and innovation of policies

To better implement policies that empower education with AI, the government needs to improve the related policy framework. On one hand, investment in technical training for educational institutions and teachers should be increased to ensure that educators are proficient in AI tools and can flexibly use these technologies to enhance teaching quality. On the other hand, there should be strengthened monitoring and evaluation of policies to ensure that AI applications in education result in substantial improvements and that imbalances and inequalities in technology application are avoided.

In terms of policy innovation, future efforts should focus on intelligent resource sharing in education, particularly in remote and resource-scarce areas. How to provide equal educational opportunities through internet and cloud computing technologies should be a key area of focus. Additionally, policies should emphasize supporting the cultivation of interdisciplinary, composite talents, especially in fields like AI, big data, and cloud computing, to drive the innovative development of new engineering education.

5. Conclusion

With the continuous development of AI technology, the education sector is undergoing a profound transformation. Especially in the context of new engineering education, AI has not only provided strong support for the updating of educational content and the innovation of teaching methods but has also played an increasingly important role in educational management and services. AI technology, through providing personalized learning paths, optimizing teaching resource allocation, and improving teaching efficiency, has brought unprecedented opportunities to the talent cultivation model in new engineering disciplines.

However, the widespread application of AI also presents many challenges. Firstly, the imbalance in the distribution of educational resources, teachers' insufficient technical literacy, and students' dependency on technology may all become obstacles to the advancement of AI-powered education. Furthermore, while policy support is gradually increasing, there is still a need to further improve the technical training mechanisms, promote the popularization of intelligent educational tools, and strengthen interdisciplinary collaboration.

To address these challenges, the future reform of new engineering education must focus on the integration of technology with educational philosophy. It is essential to leverage AI to enhance educational efficiency while

ensuring that it always serves the comprehensive development of students. Educational policies should be further improved, particularly focusing on the equitable distribution of resources, the enhancement of teachers' and students' technological literacy, and the balance between technology application and humanistic care.

In conclusion, the talent cultivation model for new engineering disciplines empowered by AI has tremendous potential and development prospects. With continuous technological advancements and policy improvements, AI will play an increasingly important role in future education, providing strong support for the cultivation of innovative and practical interdisciplinary engineering talents. However, how to ensure fairness and humanistic care in education while promoting technological innovation will be a key issue in future educational reforms.

Disclosure statement

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References

- [1] Qian L, Cao W, Chen L, 2025, Influence of AI on Higher Education Reform and Talent Cultivation in the Digital Intelligence Era. *Scientific Reports*, 15(1): 6047.
- [2] Liu Z, Li J, Wang W, 2022, Exploration on the Construction Reform of Geology Specialty with Deep Integration of Artificial Intelligence under the New Engineering Background. *Curriculum and Teaching Methodology*, 5(3).
- [3] Qiu YW, Wang AX, Li J, et al., 2025, Research on the Empowerment of Artificial Intelligence in the Intelligent Development of Higher Education. *Journal of Harbin College*, 46(02): 124–126.
- [4] Huang CC, Lu CF, Tian YY, 2025, Policy Evolution and Prospects of AI Empowerment in Higher Education: A Three-Dimensional Analytical Framework Based on “Theme-Tool-Evaluation.” *Higher Education Exploration*, (01): 48–59.
- [5] Chen H, Yu Y, Li XL, 2024, Research on the Integration of Generative AI into College Education and Teaching. *Journal of Huainan Vocational and Technical College*, 24(06): 79–81.

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Research on Strategies to Improve Listening Performance in CET-4 Using the Intelligent Laboratory

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Abstract: For non-English major college students, the listening section of the College English Test Band 4 (CET-4) is both a critical and challenging component of exam preparation. Many students struggle with various difficulties during their listening practice. To address these challenges, open intelligent laboratories equipped with digital technology provide effective solutions. These laboratories offer a diverse range of listening resources, exposing students to various accents and topics, which helps them adapt to different listening styles and improve comprehension. Additionally, they provide simulated tests and interactive exercises that replicate exam conditions, allowing students to practice time management and develop effective test-taking strategies. Furthermore, artificial intelligence algorithms integrated into these labs analyze students' strengths and weaknesses, offering personalized feedback and targeted recommendations for improvement. By leveraging smart technology in education, intelligent laboratories can significantly enhance students' listening skills and CET-4 performance, facilitating more effective learning and advancing educational practices. This paper examines the primary challenges students face in CET-4 listening preparation and explores how digital tools in open intelligent laboratories can be utilized to develop effective preparation strategies.

Keywords: College English Test Band 4 (CET-4); Listening performance; Open intelligent laboratory; Digitization means; Preparation strategies

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1. Introduction

College English is a common foundational course for non-English majors in universities. The College English Test Band 4 (CET-4) is an important English examination compulsory for non-English major students during their university studies. The CET-4 exam comprehensively assesses students' skills in listening, speaking, reading, writing, and translation. The written part of the CET-4 exam mainly tests students' listening comprehension, reading comprehension, writing, and translation abilities. The oral part of the CET-4 exam mainly assesses students' oral expression skills. The importance of the CET-4 exam for non-English major

students is self-evident. Among them, the listening section accounts for 35% of the CET-4 exam. It is obvious that the listening comprehension section holds a vital position in the CET-4 exam.

Currently, online assessment has become an inevitable trend in paperless examinations and the development of educational information technology ^[1]. It is an important innovative exploration in implementing reforms in college English teaching and examinations. The *Thirteenth Five-Year Plan for Educational Informatization* issued by the Ministry of Education in 2016 emphasizes the need to promote the deep integration of management informatization and educational teaching innovation. It aims to achieve scientific decision support, refined management processes, and real-time teaching analysis while improving the efficiency of educational management ^[2]. The exploration of information technology in educational testing and evaluation is a transition from traditional paper-based exams to online paperless exams. It can not only help schools improve the efficiency of exam management but also comprehensively collect and analyze big data from students' various dimensions of examinations ^[3]. Through scientific comparison and analysis, it can provide timely and efficient feedback for teaching. In April 2018, the Ministry of Education issued the *Action Plan for Educational Informatization 2.0*, emphasizing the need to actively promote the development of "Internet + Education" relying on various intelligent devices and networks. It aims to promote the development of educational informatization in the new era, drive the transformation of education models, and restructure the educational ecosystem supported by new technologies. In March 2021, the Ministry of Education released the *Construction Specification for Digital Campus in Higher Education Institutions (Trial Implementation)* which pointed out that in the development of educational informatization 2.0, the business applications in digital campuses should "support teaching activities such as lesson preparation, teaching, homework correction, testing, and evaluation by teachers," and "support teaching process and link management, such as curriculum design, examination scheduling, grading, and evaluation." Computers and information technology have had a significant impact on language testing and assessment, especially in areas such as test management, test design and writing, task presentation, scoring, and score analysis and reporting ^[4]. Computers and networks can greatly improve the efficiency of large-scale language testing ^[5]. The integration of intelligent devices in open laboratories provides a practical approach for the implementation of relevant teaching policies.

Therefore, it is of great significance to utilize digitization means in open laboratories and integrate these modern teaching tools into daily instruction to provide students with personalized learning experiences, enhance their learning motivation, improve teaching efficiency, and ultimately improve their performance in the CET-4 listening exam.

2. Introduction of listening section in CET-4

The listening section of the CET-4 exam consists of three passages, and each question type carries different weights, with 7%, 8%, and 20%, respectively. The listening section accounts for 35% of the total exam score. The question type includes multiple-choice, and the recordings are either in standard British English or American English. The speed of the recordings is approximately 120 to 140 words per minute, with a duration of 15 seconds after each listening question.

The CET-4 listening test assesses students' ability to comprehend oral information, including understanding explicit information, understanding implicit information, using language features to understand the listening materials, and employing listening strategies. Specifically, understanding explicit information includes grasping the main idea of the listening passage, understanding important information or specific details in the listening

materials, and comprehending the expressed opinions and attitudes of the speakers in the listening materials. Understanding implicit information involves inferring the implied meanings in the listening passage, judging the speakers' communicative competence in the listening materials, and deducing their opinions and attitudes. Using language features to understand the listening materials mainly involves discerning phonetic features in the listening materials and understanding the relationships between sentences in the listening passage. Phonetic features include identifying phonetic elements in continuous speech and understanding intonation and stress in the listening materials. Understanding the relationships between sentences in the listening passage mainly includes recognizing conditional relationships, causal relationships, contrastive relationships, and comparative relationships. Using listening strategies naturally involves employing appropriate listening strategies to aid comprehension.

3. Challenges faced in the CET-4 section

This article focuses on the research conducted on students from the classes taught by the authors at the university during the second semester of their first year in college. The classes included students from Intelligent Management Class 2301, Finance and Accounting Class 2301, Accounting Class 2302, Accounting Class 2303, and Film Production Class 2303 (181 students in total). During regular university College English classes, questions were asked to gauge their performance in answering questions in class. Additionally, some students were randomly selected during breaks to carry out conversations and record the main problems they encountered while preparing for the CET-4 listening exam.

It was found that listening posed a challenge for students during their CET-4 exam preparation. More than half of the students found the listening section particularly difficult. The main issues they faced during their preparation for the CET-4 listening exam are as follows:

Limited vocabulary: Many students had a limited vocabulary and struggled with the accurate pronunciation of words. They lacked the ability to think from the perspective of synonyms and accumulate related English expressions. This hindered their understanding of college-level English. The correct options in the listening questions are not simple repetitions of the content in the listening passage but rather involve certain synonymous expressions. Students' lack of awareness and accumulation of synonymous expressions affected their listening comprehension and accuracy.

Inadequate prediction skills: Students did not emphasize the importance of making predictions before listening, which resulted in their inability to quickly grasp the key points during the listening process. Before the listening exercises, students were aware of the scope of the upcoming listening content. However, students often failed to make timely predictions about the relevant options for each question. They passively listened without actively predicting, such as the theme of the listening passage or the relationships between characters. They only looked at the options and answered the questions during the listening process. Naturally, they struggled with questions that were slightly more difficult, resulting in lower accuracy rates.

Poor short-term memory and note-taking skills: During the listening exercises, students failed to combine the options and effectively record keywords or important information from the passage. As the CET-4 listening section only plays once, failure to take notes in a timely manner and lack of conscious short-term memory training made it difficult for students to accurately remember important information. Thus, students' short-term memory and note-taking practices also affect their listening comprehension.

4. Preparation strategies for CET-4 listening section with the assistance of intelligent laboratory

In response to the problems of insufficient vocabulary, weak predictive awareness, and poor short-term memory that students encounter in actual preparation for the CET-4 listening section, the following listening preparation strategies are proposed in combination with the intelligent tools in the open intelligent laboratory.

At first, the intelligent lab system can automatically match learning resources. In the face of a massive amount of English learning resources, students need to spend a lot of time and effort searching for suitable learning resources for themselves. However, the intelligent resource matching technology in the intelligent open laboratory can solve this problem. Artificial intelligence technology can intelligently select suitable CET-4 listening learning resources based on students' personal characteristics and needs, such as English proficiency and learning preferences. This means that students can rely on the intelligent system to provide customized recommendations to improve learning efficiency. At the same time, this personalized resource matching ensures that every student can access listening materials related to the CET-4, increasing the interest in learning and integrating English learning with academic development, thus improving the practical application of learning. This helps students strengthen their personalized vocabulary accumulation and summarize synonymous expressions. For example, students weak in news listening can accumulate news vocabulary, especially focusing on environmental, political, and international relations-related vocabulary. Students weak in long conversation listening can accumulate vocabulary related to social life topics, including family, shopping, and transportation. Students weak in listening to passages can accumulate vocabulary related to personal stories and humanities studies, including occupations, interpersonal relationships, and social customs.

Additionally, the intelligent lab system can create a contextual learning mode. Firstly, the contextual learning mode allows students to scan surrounding objects and obtain relevant CET-4 English content using intelligent devices in the open laboratory. This immersive experience not only helps students integrate English learning into their lives but also makes it easier for them to understand and master new vocabulary and concepts. Secondly, the contextual learning mode emphasizes the students' initiative, allowing them to adjust the learning process independently and break away from the time constraints of traditional classrooms. At the same time, in this mode, the role of the teacher has also changed. They no longer need to engage in the heavy work of searching and filtering resources but can focus on analyzing students' listening situations and providing corresponding guidance and feedback. For example, before listening, students need to quickly enter the listening state within a limited time, efficiently read the options of each part of the listening, actively associate the accumulated listening theme vocabulary, and understand the theme and main idea of the predicted listening passage. The contextual mode set in the open laboratory can guide students to mark the keywords of the options and check them at the key points of listening. This can consciously cultivate and exercise their predictive awareness in each listening practice, gradually developing the habit of predicting while listening.

Lastly, the intelligent lab system can offer accompanied practice. As an emerging technology, educational robots create a simulated learning environment, thus creating a real learning atmosphere for students. During the dialogue process, educational robots use their powerful language understanding and expression capabilities to promptly capture and correct students' pronunciation and vocabulary errors. This timely feedback helps students better understand and improve their oral skills, effectively "training their ears" for the CET-4 listening section. In addition, the robot plays the role of a "teacher" in students' learning. Besides imparting relevant CET-4 listening knowledge and skills, it also assesses students' performance and provides verbal encouragement and advice, offering personalized guidance based on students' performance. It can effectively provide specific

instructions for CET-4 listening note-taking, avoiding ineffective practice.

5. Conclusion

To sum up, in the field of teaching college English, the National College English Test Band 4 (CET-4) is a critical test for evaluating the English proficiency of non-English major college students. Among them, the listening section not only has a high score weight but also often becomes a challenge and focus for students in the preparation process. This study focused on the core issues encountered by students at our university in the preparation for the CET-4 listening section. By utilizing the intelligent resources in the open laboratory, this article proposed a series of targeted teaching strategies aimed at optimizing listening teaching methods, improving students' listening abilities, and meeting the high-quality requirements of college English teaching in the new era. The implementation of these strategies is expected to help students overcome obstacles in listening preparation more effectively, thereby achieving better results in the CET-4 exam and comprehensively improving their English language proficiency.

Disclosure statement

The authors declare no conflict of interest.

References

- [1] Gong J, 2019, Application of Artificial Intelligence Technology in College English Teaching. *Information and Documentation Materials*, (20): 124–125.
- [2] Gan C, 2015, A Discussion on College English Teaching under the Background of Big Data. *Heilongjiang Science*, (13): 115–116.
- [3] Hua L, Chen L, Sun M, 2017, Research on the Promotion of English Learning Transformation by Artificial Intelligence. *Modern Distance Education*, (6): 27–31.
- [4] Zhang T, Gao W, 2015, Application Research of iTEST System in CET-4 Coaching in Independent Colleges. *Vocational Education Communication*, (9): 22–24.
- [5] Zhu Z, Peng H, 2020, The Practice Path of Technology-Enabled Smart Education. *Chinese Journal of Education*, (10): 1–8.

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Current Situation and Development Strategies for Informatization Education among County High School Students

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Abstract: This study examines the current state of informatization education among county high school students. While students demonstrate a strong demand for informatization education, they face significant challenges, including inadequate hardware, limited access to online learning resources, and insufficient teacher proficiency in informatization education. Through a questionnaire survey, the research reveals an urgent need for expanded information technology courses and specialized training programs. In response, this paper proposes strategies such as increasing investment in IT education, optimizing teaching methodologies, and providing additional learning opportunities to enhance student engagement and comprehensively improve the quality of IT education and learning outcomes in county high schools.

Keywords: County high school students; Informatization education; Development strategy

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1. Introduction

Under the guidance of modern educational ideas and with the help of modern information technology, information-based education is a new educational mode that takes cultivating and improving students' information literacy as its core objective. In today's digital age, information technology develops rapidly and continues to integrate deeply with the field of education, and information education has become a key development trend in the field of education. As an important feature and strong support in the process of education modernization, educational informatization is an essential way to promote educational equity, improve educational quality, and innovate educational models. China's Ministry of Education promulgated the *Education Informatization 2.0 Action Plan* and other documents aimed at promoting the development of education informatization in the new era, which demonstrates the importance of education informatization to the country. The county is the geographical space of the county as the administrative division, and county education plays an important role in the development of education in China. Actively promoting the informatization

of county education can continuously improve the quality of education, cultivate more innovative talents, effectively narrow the gap between urban and rural education, and further promote the realization of educational equity. Information-based education can open up a broader horizon of knowledge, provide more abundant learning resources and more innovative learning methods for the vast number of students, constantly improve the comprehensive quality of students, and lay a solid foundation for the all-round development of students in the future. At present, the conditions for running schools in counties have been improved on the basis of policy support, and all localities are actively exploring and promoting educational reform. However, due to various factors such as the level of economic development, the distribution of educational resources, and regional cultural concepts, there is still a significant gap between education in counties and urban areas. This gap is not only reflected in the equipment of information infrastructure but also in the information literacy of teachers and students, the application level of information teaching, and the overall development environment of education information.

In the field of informatization education, many scholars have carried out in-depth and systematic exploration from multiple perspectives, laying a solid foundation for the follow-up research on the informatization education level of county high school students. Previous studies mainly focused on the level of information-based education in different regions and stages of education, the impact of information-based education on education and teaching, and the evaluation of information-based education.

According to the specific development situation of different regions, many scholars have carried out research on the level of informatized education. For example, in Tibet, a survey was conducted among 3,134 primary and secondary school teachers to explore the current situation of education informatization promoting high-quality development of basic education. The research shows that there are problems such as the disconnect between planning and practice, lagging infrastructure support, poor adaptation of teaching resources, and insufficient teachers' information-based teaching skills, and there are obvious differences between urban and rural areas and between different student groups. Based on this, the research suggests that we should adhere to high-level promotion, cooperate with multiple subjects, dispel "path dependence," and highlight application orientation, so as to promote the development of basic education informatization in Tibet^[1]. The informatization construction of county education is a key link to realizing the modernization of education. The paper *Thoughts on Promoting the informatization Construction of County Education* takes Shanxi Province as an example. The research results show that there are problems such as insufficient understanding of education informatization, lack of scientific planning, shortage of capital investment, and low level of teachers' information technology. It put forward suggestions such as changing the concept, improving the planning system, and increasing the investment of funds^[2].

The research on informatization education level in different education stages also provides an important reference for follow-up research. In terms of informatization teaching literacy of rural preschool teachers, some studies take education informatization 2.0 as the background; using the questionnaire survey and interview of 26 rural kindergarten teachers in Hebei, Henan, and Shandong provinces, the studies reveal that the informatization teaching literacy of rural preschool teachers is at a relatively high level overall, but there are some differences among individuals. Based on these research findings, development strategies such as strengthening top-level design, optimizing support service system, and improving curriculum integration ability are proposed^[3]. In the research on information-based teaching in secondary vocational schools, taking secondary vocational schools in Heilongjiang Province as an example, it is found that there are challenges such as a large gap in digital campus construction and low informatization quality of teachers, and countermeasures such as strengthening

informatization construction, improving teachers' digital literacy, and building an information-based teaching and research community are proposed ^[4].

At the same time, in-depth analysis of the impact of informatization on education is also one of the key research directions in this field. Xie and Guo took the course "Fundamentals of Computer Application" as an example to analyze the cultivation path of middle school students' innovation ability under the background of education informatization. They proposed that an application model of education informatization should be constructed and stressed that teachers should actively adopt strategies such as changing teaching methods to better adapt to the new era background of education informatization and further cultivate students' innovative thinking and innovation ability ^[5]. There are also studies focusing on the application of modern educational technology in rural revitalization, believing that it is conducive to improving the quality and level of rural education. However, in the face of the digital divide and other problems, it is necessary to further increase the investment and improvement of modern educational technology infrastructure construction ^[6]. The article *Practical Problems and Countermeasures of Informatization to Help the Development of Rural Education* took Linxia as an example to analyze the current situation and dilemma of rural education, pointing out that there are problems in rural education such as poor network conditions, weak teachers' informatization teaching ability, and lack of digital education resources, which seriously restrict the high-quality development of rural education. Based on this, it is further proposed to carry out accurate help by information technology, solve key problems, and realize method optimization and innovation ^[7].

In addition, some studies focus on the construction of the monitoring and evaluation framework for the development level of education informatization in terms of its monitoring and evaluation. By systematically combing the relevant research results at home and abroad, the development level of education informatization at the county level is divided into four stages: starting, application, integration, and innovation; and the four core dimensions of "management and service," "information teaching environment," "teachers' information teaching level," and "students' information learning level" are constructed. This research result plays an important role in the scientific evaluation of the development level of county-level education informatization ^[8].

To sum up, the research results related to information-based education are relatively abundant, but most of the research focuses on educators, that is, the information-based education level of schools and the information-based teaching literacy of teachers, and puts forward corresponding improvement measures and solutions to problems according to the specific situation. However, there are few existing studies on the educatees' information-based education level, and it is difficult for researchers to fully and deeply reveal the practical problems faced by students in the process of information-based education, as well as their actual demand and application of information-based education resources. As a result, education departments lack comprehensive understanding and scientific planning of educatees' information-based education level and often fail to formulate relevant policies and provide educational support, thus affecting students' all-round development. This study aims to make up for the shortcomings of existing studies, focusing on the specific group of county high school students, conduct an in-depth analysis of the current situation and clear the current problems faced by information education, and provide more targeted and effective suggestions for promoting the development of county education information. Therefore, in-depth research on the informatization education level of county high school students can not only accurately grasp the current situation of county informatization education, but also lay a solid foundation for promoting the improvement of the informatization education level of county high school students and inject impetus into the county education cause.

2. Research methods

2.1. Survey methods and subjects

This study mainly adopted the questionnaire survey to explore the informatization education level of county high school students, starting from January 2025. The questionnaire was designed from five dimensions: students' information literacy, students' information learning ability, perception of information education environment, evaluation of teachers' information teaching level, and overall perception. The survey subjects were high school students in Hunan and Henan counties. 82 valid questionnaires were collected, which provided the data basis for further analysis of the informatization education level of high school students in the counties.

2.2. Questionnaire survey data processing

In this paper, SPSS16.0 for Windows software was used to analyze the questionnaire data, such as descriptive statistics, difference test, and response rate.

3. Results and analysis

3.1. Gender difference

As shown in **Table 1**, a *t*-test (independent sample *t*-test) was used to study gender differences in the above five items. Different gender samples showed no significant differences in the overall perception of students' information literacy in two items ($P > 0.05$). However, there were significant differences in students' information-based learning ability, perception of information-based teaching environment, and evaluation of teachers' information-based teaching level among different gender samples. Gender showed a 0.01 significance level ($t = -3.369$, $P = 0.001$) for students' information-based learning ability, and the average value of females (3.24) was significantly lower than that of males (3.86). The perception of information teaching environment showed a 0.01 significance level ($t = -2.690$, $P = 0.009$), and the mean value of females (3.05) was significantly lower than that of males (3.41). Gender showed a 0.05 significance level for the evaluation of teachers' informatization teaching level ($t = -2.141$, $P = 0.035$), and the mean value of females (3.34) was significantly lower than that of males (3.81).

Table 1. Gender difference *t*-test

	Gender (mean \pm SD)		<i>t</i>	<i>P</i>
	Female (<i>n</i> = 58)	Male (<i>n</i> = 24)		
Student information literacy	3.49 \pm 0.74	3.52 \pm 0.59	-0.180	0.858
Students' information learning ability	3.24 \pm 0.74	3.86 \pm 0.77	-3.369	0.001**
Perception of information-based teaching environment	3.05 \pm 0.55	3.41 \pm 0.54	-2.690	0.009**
Evaluation of teachers' information-based teaching level	3.34 \pm 0.87	3.81 \pm 0.99	-2.141	0.035*
Overall perception	1.95 \pm 0.69	1.75 \pm 0.90	1.085	0.281

* $P < 0.05$, ** $P < 0.01$

3.2. Difference test of whether they have participated in additional learning activities related to information technology

As presented in **Table 2**, the *t*-test was used to study the difference between the participation in additional learning activities of information technology (such as robotics, programming extracurricular learning groups,

etc.) and the above five items. No matter whether they have participated in additional learning activities of information technology, there is no significant difference in the overall perception of two items on the evaluation of teachers' informatization teaching level ($P > 0.05$). However, the samples with or without participation in additional learning activities of information technology have significant differences in students' information literacy, students' information learning ability, and their perception of information teaching environment. For students' information literacy, the level of significance was 0.05 ($t = -2.219$, $P = 0.029$), and the mean value of no (3.44) was significantly lower than that of yes (4.00). For students' information learning ability, it showed a 0.01 significance level ($t = -2.645$, $P = 0.010$), and the mean value of no (3.35) was significantly lower than the mean value of yes (4.11). For the perception of information teaching environment, there was a 0.05 significance level ($t = -2.550$, $P = 0.013$), and the mean value of no (3.10) was significantly lower than the mean value of yes (3.62).

Table 2. Difference test of whether they have participated in additional learning activities of information technology

	Participation in any additional learning activities related to IT (e.g. robotics, programming extracurricular learning groups, etc.) (mean \pm standard deviation)		<i>t</i>	<i>P</i>
	No (<i>n</i> = 74)	Yes (<i>n</i> = 8)		
Student information literacy	3.44 \pm 0.65	4.00 \pm 0.90	-2.219	0.029*
Student's information learning ability	3.35 \pm 0.77	4.11 \pm 0.77	-2.645	0.010**
Perception of information-based teaching environment	3.10 \pm 0.55	3.63 \pm 0.53	-2.550	0.013*
Evaluation of teachers' information-based teaching level	3.42 \pm 0.89	4.03 \pm 1.12	-1.797	0.076
Overall perception	1.91 \pm 0.71	1.75 \pm 1.16	0.370	0.721

* $P < 0.05$, ** $P < 0.01$

3.3. Response rate statistics of school information resource demand

The chi-square goodness of fit test was used to analyze whether the proportion of multiple choice options was evenly distributed. In **Table 3**, the goodness of fit test does not show significance ($\chi^2 = 7.473$, $P = 0.058 > 0.05$), which means that the selection ratio of various options is relatively uniform. The current school faces problems such as old equipment, insufficient equipment, and unstable network.

Table 3. Response rate of the main reasons for the unsatisfactory information equipment provided by the school

Item	Response		Penetration rate (<i>n</i> = 32)
	<i>n</i>	Response rate	
Old equipment	17	30.91%	53.13%
Insufficient equipment	16	29.09%	50.00%
Unstable network	17	30.91%	53.13%
Other	5	9.09%	15.63%
Summary	55	100%	171.88%

Note: $\chi^2 = 7.473$, $P = 0.058$ for goodness of fit test

The chi-square goodness of fit test was used to analyze whether the selection ratio distribution of multiple choice options was uniform. In **Table 4**, the goodness of fit test showed significance ($\chi^2 = 57.822$, $P = 0.000 < 0.05$), which means that the selection ratio of each item was significantly different, and the difference could be compared by response rate or popularity rate. Specifically, the response rate and penetration rate of adding information technology courses, carrying out information technology training, and providing more online learning resources are significantly higher.

Table 4. Response rate of suggestions and expectations for information-based teaching in schools

Item	Response		Penetration rate ($n = 82$)
	n	Response rate	
Adding information technology courses	64	29.91%	78.05%
Offering information technology training	53	24.77%	64.63%
Updating information technology	45	21.03%	54.88%
Providing more online learning resources	52	24.30%	63.41%
Other	0	0.00%	0.00%
Summary	214	100%	260.98%

Note: $\chi^2 = 57.822$, $P = 0.000$ for goodness of fit test

4. Discussion

4.1. The differentiation of information-based education level caused by gender factors

Based on the questionnaire survey data, the average value of male students is significantly higher than that of female students in three dimensions: students' information-based learning ability, perception of information-based teaching environment, and evaluation of teachers' information-based teaching level. According to the analysis of previous literature, the usage behavior of male students in computer network technology and information communication is significantly higher than that of female students. Male students have a higher sense of self-efficacy than female students in using information technology. They have higher self-confidence and believe that they can better master this technology. They are also more inclined to apply the technology skills they have learned in real life^[9].

Specifically, male students master new information technology skills in a shorter time and apply them to their learning practices. In perceiving the information-based teaching environment, male students are more sensitive to its impact and make full use of these resources to improve their learning results. Girls, on the other hand, have little contact with resources in the information-based teaching environment, which affects their positive perception of the teaching environment. In the teaching process, teachers usually adopt unified teaching methods and content. Boys may be more interested in programming content with strong logical thinking, while girls may be better at understanding and using images and words, resulting in the differentiation of girls' and boys' information-based education levels.

These differences indicate that in the current county informatization education, the design of teaching content and teaching methods may not fully consider the gender characteristics and learning needs of male and female students. This puts female students in a relatively inferior position in some aspects of informatization education to a certain extent and thus has an impact on the overall improvement of their information literacy

and comprehensive ability.

4.2. The influence of additional information technology learning activities on students' information literacy

The degree of participation in additional learning activities of information technology plays a key role in the improvement of students' information literacy. However, the results of the questionnaire survey show that only about one-tenth of the students have participated in additional IT learning. Specifically, students with additional IT learning experience are more accurate in information acquisition, screening, and use, and are more proficient in using a variety of IT tools to carry out independent learning. At the same time, they can better adapt to and make use of various resources and facilities in the information-based teaching environment. However, students who have not participated in additional information technology learning activities are often in a relatively backward position in information literacy, information learning ability, and perception of information teaching environment.

At present, there are some problems in the high school information technology curriculum, such as the lack of pertinence in teaching design and the disconnection between students' knowledge forgetting and learning. The pertinence of teaching should be improved, and the sustainability of information technology application should be ensured^[10]. Additional information technology learning activities, such as programming competitions and information technology clubs, provide more practical opportunities for students, stimulate students' interest in information technology, promote students to apply what they have learned to practical situations, and cultivate students' problem-solving ability and innovative thinking.

It can be seen that it is difficult to fully meet the needs of students to improve information literacy only by relying on conventional information education and teaching in the county, and students' lack of awareness to actively participate in additional information technology learning activities greatly limits the development space of some students in the field of information education.

4.3. Students' demand for information-based education resources and teaching methods

Diversified and interactive teaching methods can stimulate high school students' interests and enhance class participation. Through the questionnaire survey, it is found that county high school students have a high demand for increasing information technology courses, carrying out information technology training, and providing more online learning resources. At the same time, students also have high expectations for innovative and interactive teaching methods, which will help students deepen their understanding of knowledge in exchanges and cooperation.

This reflects the current county high school information education in the provision of resources and equipment and teaching mode. However, there are certain deficiencies that cannot fully meet the learning needs of students. Currently, there are hardware problems, including old equipment and insufficient equipment in county high schools, as well as scarce online learning resources. In addition, there are still some problems in the training of teachers' informatization level, such as lack of pertinence and some teachers' reluctance to update their teaching skills. As a result, teachers are not skilled enough in the use of informatization teaching tools and cannot use online teaching software smoothly, which affects the online teacher-student interaction, teaching effect, and student experience^[11].

5. Countermeasures and suggestions

5.1. Gender-specific design of information education

Information-based education is an indispensable part of the current new teaching methods. According to the data, the use behavior and self-efficacy of boys in information-based education are significantly higher than that of girls. It is true that gender differences exist in information-based education, which will affect the quality of information-based teaching ^[12]. Therefore, it is extremely important to carry out gender-specific education, and education departments should encourage schools and teachers to design different teaching contents and methods according to students' gender characteristics and learning needs. For boys, programming content with strong logical thinking can be added to meet their interest and needs in information technology. For girls, more content related to images and word processing can be introduced to give full play to their advantages in understanding and using images and words. A hierarchical and diversified teaching model can also be built to help teachers better teach students according to their aptitude, break the gender barrier, give lessons according to different levels of students, and rationally allocate resources, so as to enhance the actual effect of information-based education ^[13].

In addition, since girls are in a relatively inferior position in some aspects of information education, enhancing girls' sense of information technology self-efficacy is also a critical part. Teachers can encourage, praise, and provide specific learning guidance to help girls enhance their confidence in learning information technology. At the school level, IT-related competitions and activities can be organized to encourage girls' active participation in order to enhance their interest in and mastery of IT. Gender equality of information education resources should be ensured to avoid the influence of gender bias and stereotypes. At the same time, male and female students should be encouraged to participate in information technology learning and practice activities to promote their mutual understanding and cooperation.

5.2. Emphasizing the consistency in the construction and use of information-based education

Compared with conventional information education and teaching, additional information technology learning has a more far-reaching impact on the development of students' information ability. Information-based education should not only be a good information-based classroom, but the integration of subsequent educational resources and educational content is the key ^[13]. The government and education departments should increase the investment in the information-based education of county high schools and improve the hardware conditions of schools. The number of equipment should be updated and increased to ensure that students have full access to and use of information-based education resources. Schools should also change their ideas, build an information-based education system, utilize hardware facilities, and increase the frequency of use. Schools should optimize the teaching design of information technology courses to ensure that the teaching content is in line with students' actual needs and interests. The link between IT courses and practical activities should be strengthened to ensure that students can apply what they have learned in practice and improve their information literacy and practical ability. Through lively and interesting classroom teaching and practical activities, teachers can stimulate students' interest and enthusiasm in information technology, encourage students to actively participate in information technology learning and practical activities, and cultivate their independent learning ability and innovative thinking. It is necessary to integrate information education in the classroom as well as the campus education system.

5.3. Improving the quality of teaching through innovative and interactive teaching models

It is obvious that county high school students have a demand for information-based education. However, due to the lack of information education hardware and online learning resources, the lack of teachers' information level training, and some teachers' resistance to updating teaching skills, etc., the effect of information education and students' experience are affected, leading to challenges in meeting academic needs^[14]. In this regard, schools should actively create opportunities for students to have access to information-based education resources and provide more opportunities for additional learning activities such as information technology competitions and associations, so as to meet students' interest in and demand for information technology and mobilize students' enthusiasm for information-based learning. Training should be conducted for teachers to enrich online learning resources and enhance teaching quality. We should actively develop and introduce high-quality online learning resources to meet the learning needs of students. Teachers are encouraged to adopt innovative and interactive teaching methods, such as flipped classrooms and project-based learning^[15]. Through group cooperation, discussion, and communication, students' interests and participation in learning can be stimulated, improving their learning effect and teamwork ability. Multiple measures should be taken to strengthen the allocation of information education resources and teacher training, so as to stimulate students' interest and comprehensively enhance the quality of information education and students' learning effect in county high schools.

Disclosure statement

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References

- [1] Xiao L, Zheng Z, Song N, 2023, Review of the Current Situation of Promoting High-Quality Development of Basic Education in Tibet through Education Informatization: Based on the Survey and Analysis of 3134 Teachers' Influencing Factors of Intelligent Education Literacy. *Journal of Tibet University (Social Sciences Edition)*, 38(01): 237–245.
- [2] Gao Y, 2014, Thoughts on Promoting the Construction of County Education Informatization. *Education Theory and Practice*, 34(26): 20–22.
- [3] Li C, Ma J, 2022, Investigation and Research on the Information Technology Teaching Literacy of Rural Preschool Teachers in the Era of Education Informatization 2.0. *Journal of Hebei Normal University (Education Science Edition)*, 24(05): 108–113.
- [4] Meng Y, 2024, Challenges and Countermeasures of Informationized Teaching in Secondary Vocational Schools in Heilongjiang Province. *Adult Education*, 44(08): 80–84.
- [5] Xie X, Guo X, 2024, Pathways for Cultivating Middle School Students' Innovation Ability in the Context of Educational Informatization—Review of “Fundamentals of Computer Application.” *Applied Chemical Industry*, 53(03): 762.
- [6] Bian W, 2023, Application of Modern Educational Technology in Rural Revitalization. *China Fruits*, (12): 141.
- [7] Li H, 2022, Practical Problems and Countermeasures of Informationization in Promoting Rural Education Development. *Educational Research and Experiment*, (06): 92–96.
- [8] Li H, 2017, Research on the Construction of Monitoring and Evaluation Framework for County-level Educational Informatization Development. *China Educational Technology*, (07): 107–114.

- [9] Xue W, 2015, Research on Gender Differences in Educational Technology Use Behavior from the Perspective of Self-Efficacy. *Education Research*, 36(04): 124–128.
- [10] Wei T, 2024, The Impact of High School Information Technology Courses on Students' Information Literacy. *College Entrance Examination*, (31): 54–56.
- [11] Yu J, Yuan S, Zhou X, 2020, Investigation and Research on the Current Situation of Informationization Construction in Regional Primary and Secondary Schools—Taking X City in Hubei Province as an Example. *China Education Informatization*, (09): 82–85.
- [12] Wang J, 2019, The Impact of Gender Differences on College Students' Adaptation to Informationized Teaching—Taking Hubei Normal University as an Example. *Journal of Hubei Normal University (Natural Science Edition)*, 39(02): 90–99.
- [13] Li J, 2024, Promoting County-Level Educational Informatization Construction to Achieve Co-Construction and Sharing of High-Quality Educational Resources. *Shanxi Education (Management)*, (12): 6–7.
- [14] Zhang Y, 2024, Exploration of Innovative Paths for County-Level Educational Informatization Construction under the Background of Rural Revitalization. *Jilin Education*, (33): 5–7.
- [15] Rao A, Wan K, Ren Y, 2019, Strategies for the Development of County-Level Basic Education Informatization from the Perspective of High-Quality and Balanced Development. *China Educational Technology*, (08): 37–43.

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Review of the “New Crafts” International Exhibition of Arts and Crafts: Focusing on an Integrated Innovation Perspective

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Abstract: This article explores the transformative process of the philosophical concepts in new craft arts, along with the interactive relationship between technological logic and cultural expression, within the context of digital intelligence empowerment. Through an analysis of specific artworks, it aims to reveal the potential value of digital intelligence technologies in shaping contemporary craft arts, particularly in terms of artistic expression, cultural heritage, and social responsibility.

Keywords: Traditional craft innovation; Academic exhibition; Integrated innovation

Online publication: March 27, 2025

1. Introduction

Under the impact of globalization and technological revolution, the survival of traditional crafts faces dual challenges: (1) industrialized production has squeezed the living space of handicrafts; (2) cultural homogenization has dissolved the local knowledge behind the crafts. How to realize the contemporary transformation of traditional crafts has become a core issue in the field of cultural heritage protection and innovative design. As an experimental field of cultural practice, academic exhibitions have provided a path for the transformation of traditional crafts from “heritage protection” to “knowledge production” through the integration of innovative concepts in recent years. This article takes the “New Crafts” International Exhibition of Arts and Crafts as the research object and conducts case analysis based on the theory of craft innovation, exploring how academic exhibitions can promote the reconstruction of traditional craft values and the innovation of communication paradigms through the triple paths of regional ethnic integration, industry-university-research integration, and sustainable integration.

2. Overview of the exhibition

The “New Crafts” International Youth Arts and Crafts Exhibition and Academic Seminar was initiated by young teachers from the Department of Arts and Crafts, Academy of Arts & Design, Tsinghua University, in collaboration with 42 art institutions around the world in 2015. It is committed to inheriting and innovating traditional crafts, respecting the diversity of arts from various countries, showcasing the contemporary youth style, and promoting the development of modern cultural heritage. So far, it has successfully held seven editions, covering more than ten cities, including Beijing, Tokyo, Shanghai, and Dhaka, and has become a high-end academic platform connecting global young craft creators. Participants include teachers and students from universities, senior arts and crafts masters, and freelance artists. The works cover ceramics, metals, fibers, lacquer arts, glass, and other categories. The exhibition has attracted more than 15,000 participants from dozens of countries and has established a lasting influence in the field of international arts and crafts. The sustainable development of the exhibition benefits from scientific research support and funding from multiple sources. From 2018 to 2024, it received funding support of over 2.15 million yuan from the National Art Fund, Beijing Art Fund, Jilin Art Academy, and other institutions. These resources not only guarantee the academic quality of the exhibition but also promote the transformation of scientific research achievements. For example, four volumes of the *International Arts and Crafts Exhibition Collection* have been published, systematically documenting cases of youth innovation and practice, providing important references for the academic community. The core value of “New Crafts” lies in providing a cross-disciplinary growth platform for young talents. It invites scholars from universities, inheritors of intangible cultural heritage, and representatives of technology enterprises to discuss the modernization transformation path of traditional skills. Through seven years of practice, “New Crafts” has not only become an important brand in the field of arts and crafts but also provided a replicable model for enhancing the international voice of Chinese traditional culture. In the new era, both global development trends and domestic construction needs pose unprecedented challenges to our art education and discipline construction, and reform is unavoidable ^[1].

3. Analysis of integrated innovation practice paths driven by the exhibition

3.1. Cross-regional integrated innovation

Research on the impact of geographical distance on the performance of scientific research collaboration. Scientific research collaboration has always tended to occur between organizations or individuals in close geographical proximity, which facilitates effective communication and promotes more frequent information exchange and the dissemination of tacit knowledge during the interaction process ^[2]. In the environment of traditional craft innovation and development, integrated innovation through joint research, learning, and practice across different regions can not only enhance mutual understanding and respect among various cultures, stimulate unique traditional craft innovation and development, but also give birth to new paradigms of innovation through collisions between traditional crafts of different countries. This allows traditional crafts from various countries to gain new vitality in a new environment, thus achieving better inheritance and development. As Hang ^[3] stated in *The Idea of Craftsmanship*, “The contemporary transformation of traditional crafts requires the reconstruction of their cultural subjectivity in the context of globalization.”

Since 2015, “New Crafts” has organized international seminars and exhibitions, gathering exquisite works from young arts and crafts creators from various countries around the world. It advocates respecting the diversity of arts from different countries, showcasing the contemporary youth style, and promoting the development of modern cultural heritage. Through the display of innovative craft works from China and abroad,

international academic seminars, and talent cultivation practices, it stimulates innovative thinking in traditional Chinese crafts and explores suitable forms and methods of innovation for China.

From July 21 to July 29, 2016, the “Intangible Cultural Heritage into Tsinghua”—“New Crafts” overseas study tour (Tokyo, Kyoto, Nara), hosted by the Intangible Cultural Heritage Department of the Ministry of Culture and organized by Tsinghua University’s Academy of Arts & Design, focused on exchanging intangible cultural heritage aesthetics through skill exchanges. Selected Chinese intangible cultural heritage scholars interacted with Japanese masters of arts and crafts such as ceramics, lacquer arts, dyeing, metal casting, Buddhist statues, and colored glaze. Activities included visits to university craft laboratories, lectures and exchanges, traditional craft seminars and exhibitions, and museum studies. These activities enabled a new generation of Chinese intangible cultural heritage masters to expand their international horizons while promoting the unique characteristics of Chinese intangible cultural heritage. They also learned traditional skills from foreign intangible cultural heritage, overcame some technical problems, served the inheritance and development of Chinese intangible cultural heritage, and deepened their understanding of the ethnic characteristics of Chinese intangible cultural heritage. The program aimed to cultivate future Chinese intangible cultural heritage masters with a contemporary perspective and universal values. As Chinese intangible cultural heritage continues to develop domestically, further enhancing the accomplishments and international perspectives of high-end talents in this field has become an important and indispensable aspect. “New Crafts” actively carries out exchanges and cooperation with foreign intangible cultural heritage education and research institutions, encouraging traditional craft practitioners to engage in exchanges and cooperation with artists and designers from other countries to explore the possibilities of cross-cultural integration.

3.2. Integration of industry, education, and research for innovation

The contemporary transformation of traditional crafts provides broader ideas and solutions for traditional craft innovation by bringing together perspectives, aesthetics, and resources from different fields. This promotes the injection of modern elements and functionality into traditional crafts, breaking down cultural, regional, and industrial barriers and enabling the wider dissemination and promotion of traditional crafts, thus providing more development opportunities and resources.

The integration of industry and education is an important mechanism in the new era to promote cooperation between universities and enterprises in educating and collaborating on innovation ^[4]. In the field of intangible cultural heritage research, universities, governments, and other research institutions bear an unshirkable responsibility. This includes establishing scientific laboratories for traditional craft intangible cultural heritage to address theoretical and practical issues in traditional craft protection, focusing on emerging and cutting-edge issues to deepen intangible cultural heritage research and enhance the status of Chinese intangible cultural heritage studies, conducting restoration research on traditional handicrafts of intangible cultural heritage, materials and skills research, preservation and restoration techniques research, and other specific basic scientific research on intangible cultural heritage to extend Chinese intangible cultural heritage traditional handicraft research into specific details. It is also recommended that China promptly revise intangible cultural heritage laws and regulations, re-examine the methodology for classifying intangible cultural heritage in China, and redefine and reasonably classify it to facilitate understanding, promotion, and practice ^[5]. The “New Crafts” exhibition upholds the concept of passing on the torch and emphasizes how young people understand traditional innovation as one of its characteristics. The youth brings vitality, creativity, and passion to traditional crafts, introducing new ideas, technologies, and market opportunities. Additionally, they often possess strong cross-

border integration abilities, enabling them to combine traditional crafts with other fields, expanding application areas, and enhancing practicality and marketability. The exhibition establishes a high-end international academic platform for universities, senior technicians, and freelance artists, expanding the international horizons of youth. It encourages them to deeply study traditional crafts and master core techniques and essences, and it facilitates communication and collaboration among them, promoting innovation and development. Furthermore, the exhibition platform fosters cooperation among different fields, creating products that align with modern aesthetic and usage preferences, thus advancing the contemporary transformation of traditional crafts. “The traditional handicraft industry is a crucial component of Chinese traditional culture and a significant resource for modern innovative industries. As social and economic development and consumer demand diversify, the handicraft industry faces challenges and opportunities for transformation and upgrading. To adapt to market changes, the handicraft industry needs to explore new development models and create higher added value and social benefits. The ‘New Crafts’ exhibition provides a vital platform connecting academics, industry, and market development”^[6].

3.3. Integration of sustainable ideas with innovation

Article 1 of the 2003 Convention for the Safeguarding of the Intangible Cultural Heritage clearly states: “The purposes of this Convention are: (1) To protect the intangible cultural heritage; (2) To respect the intangible cultural heritage of the communities, groups, and individuals concerned; (3) To raise awareness at the local, national, and international levels of the importance of the intangible cultural heritage, and of mutual appreciation thereof; (4) To provide international cooperation and assistance”^[7]. Since the Industrial Revolution, the development view that only focuses on economic growth has led to a situation of “high input, high consumption, and high pollution,” squandering a large amount of natural resources and causing severe damage to the ecological balance. In response to this environmental situation, the World Commission on Environment and Development proposed “sustainable development” in its 1987 report *Our Common Future*, and defined it as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”^[8]. As global environmental issues become increasingly severe, environmental protection and sustainable development have become the focus of attention in various fields of society. Traditional crafts represent the diversity and uniqueness of human culture and need to be protected and inherited through various means. However, these methods of protection and inheritance may sometimes conflict with contemporary sustainable concepts and practices.

Wood-fired ceramic art is considered one of the typical traditional crafts that contradict contemporary environmental sustainability concepts. Wood-fired ceramic art is a dialogue between humans and the kiln, a dance between fire and clay. The success of wood-fired ceramics depends on the relationship between clay, fire, wood, and the kiln, which requires multiple firing tests and continuous adjustments. Using this wood-fired technique to fire ceramics, the surface of the work can feel the kiss of the flame flowing over the body and the ash glaze produced by the ash of burned wood. Each piece is unique and cannot be replicated, possessing high artistic value^[9]. However, in the traditional wood-fired process, the burning efficiency of wood is low, which may lead to energy waste. Wood burning releases a large amount of carbon dioxide, exacerbating the greenhouse effect. The use of large amounts of wood for firing may lead to deforestation and affect ecological balance. Incomplete combustion of wood may produce harmful substances, such as particulate matter and carbon monoxide, affecting air quality. Therefore, the “New Crafts” curation team planned the “Wood-fired Ceramics and Environmental Protection” intangible cultural heritage talent training project. This project, funded

by the Beijing Culture and Art Fund in 2018, is hosted by the Academy of Arts & Design, Tsinghua University. It brings together more than 20 experts in the field of wood-fired ceramics from China, Japan, and the Republic of Korea and convenes 20 wood-fired ceramic artists from across the country. Through innovative research on traditional ceramic wood-fired techniques, academic seminars, practical exploration, international exchanges, creative exhibitions, and other methods, it builds a platform for outstanding wood-fired ceramic talents, creates conditions, and provides services to promote the cultivation of ceramic talents, shape ceramic wood-fired brands, and comprehensively promote the cultivation of artistic talents.

The project integrates multidimensional and three-dimensional thinking in materials science, thermal engineering, fine arts, design, and cultural heritage studies, building a contemporary, high-end wood-fired art platform. It promotes the contemporary innovative ecological transformation concept of traditional wood-fired ceramics and explores a scientific improvement path for smoke-free wood firing through the recirculating firing of biomass particles with smoke and dust reduction. This practice echoes the “technology empowerment” path, which breaks through the technical bottlenecks of process innovation through cross-field collaboration^[10]. It provides a practical case reference for the theory and practice of sustainable development of contemporary Chinese wood-fired art.

4. Conclusion

The study found that academic exhibitions, through integration and innovation, not only promote the technological upgrading of the craft itself but also reconstruct the dual identity of traditional crafts as “cultural media” and “knowledge systems” in the context of globalization and localization. This conclusion fills the research gap of the “exhibition-driven integration and innovation path of traditional crafts”; in practice, it provides an operable framework for curators, craftsmen, and policymakers. Future research can further track the long-term cultural impact of integration and innovation and explore the deep coupling path of craft education systems and digital technology.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Fang X, 2021, Live up to the Times and Be Committed to Innovation, China Culture Daily, May 16, 2021, (002).
- [2] Liu Z, Shan J, 2013, Technological Distance, Geographical Distance, and the Synergistic Innovation Effect of Universities and Enterprises—A Study Based on Joint Patent Data. *Studies in Science of Science*, 31(09): 1331–1337.
- [3] Hang J, 2016, The Idea of Craftsmanship, Shandong Pictorial Publishing House, Shandong.
- [4] Dai B, Zhang M, 2019, Exploration and Practice of Creating a “Triple Helix” Cross-Regional Industry-Education Integration Model. *Chinese University Science & Technology*, 2019(08): 76–78.
- [5] Liu R, 2016, Discussing the Protection of Traditional Handicrafts in Intangible Cultural Heritage from a Sino-Japanese Comparison. *Decoration*, 2016(12): 30–36.
- [6] Li Y, 2023, Keynote Speech at the 6th “Xinjiyi” International Arts and Crafts and Academic Seminar, viewed March 4, 2025, https://mp.weixin.qq.com/s/pArWh_SX6V8aDd1FIwwRVQ

- [7] International Exchange and Cooperation Bureau of the Ministry of Culture and Tourism of the People's Republic of China, 2003, Compilation of Basic Documents of the UNESCO Convention for the Protection of the Intangible Cultural Heritage (2014 Edition), Internal Material, General Provisions, Article 1.
- [8] Ministry of Environmental Protection Science and Technology Standards Department, China Environmental Science Society, 2018, Environmental Management Knowledge Q&A, China Environmental Publishing Group, Beijing, 5.
- [9] China Arts and Crafts Society, 2023, Appreciation | Wood-Fired Ceramics—The Dance of Fire and Earth, viewed March 4, 2025, <https://m.cnacs.net.cn/19/202308/5214.html>
- [10] Li Y, 2015, Introduction to Arts and Crafts, China Light Industry Press, Beijing.

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Research on the Reform of Hybrid Teaching Content in Transportation Engineering Courses under the Background of Smart Transportation

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Abstract: Smart transportation is a key direction and trend in the development of China's public transportation sector. Under this background, new opportunities for the development of transportation engineering education have emerged, necessitating the active promotion of hybrid teaching in transportation engineering courses. This approach aims to achieve innovation in teaching content and enhance the quality and effectiveness of education. Therefore, to improve the quality of transportation engineering education, this paper conducts research and exploration on the reform of hybrid teaching content. It proposes several measures, including constructing a dynamic teaching content system, strengthening faculty education and training, improving teaching facilities and technical support, and reinforcing students' self-discipline in learning. These initiatives aim to promote the reform of transportation engineering courses under the current smart transportation background and enhance the overall level and quality of education.

Keywords: Smart transportation; Transportation Engineering course; Hybrid teaching

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1. Introduction

With the rapid development of smart transportation, China's transportation industry is undergoing unprecedented changes. Smart transportation not only helps improve the efficiency of public transportation but also provides more convenient public transportation services^[1]. In this context, vigorously promoting the reform of hybrid teaching content for transportation engineering courses has become crucial. Through this initiative, online and offline teaching modes can be deeply integrated, highlighting innovation in the education and teaching process and promoting continuous optimization and enhancement of students' learning effectiveness and quality. Therefore, it is necessary to focus on the reform of hybrid teaching content to vigorously promote changes in transportation engineering courses, thereby strengthening the quality and effectiveness of course education and improving students' professional levels and abilities.

2. Overview of smart transportation

Smart transportation is a new model of public transportation development based on networks such as the Internet and the Internet of Things, with smart road networks, smart equipment, smart travel, and smart management as its components. Its most prominent features are information exchange, real-time monitoring, collaborative management, and the integration of people and things. Smart transportation covers multiple dimensions, such as smart monitoring of public traffic flow, smart control of traffic signals, smart vehicle navigation, smart parking management, and smart road safety control. In this process, artificial intelligence technology is integrated to enhance the management and operation level of the transportation system and promote the intelligentization of traffic management practices ^[2]. The core value of smart transportation lies in using network information technology to transform and obtain public transportation information and conduct substantive analysis. Then, based on big data analysis results, smart scheduling and optimal control of public traffic flow are performed. This reduces the probability of congestion in public transportation, improves the efficiency and convenience of public transportation, provides high-quality public travel services, and enhances the level and quality of public transportation management ^[3].

3. Significance of hybrid teaching reform in transportation engineering courses in the context of smart transportation

In the context of smart transportation development, vigorously constructing a hybrid teaching model for transportation engineering courses is of great significance and value. It can promote innovative changes in transportation engineering course instruction and provide students with a more convenient and novel learning experience, thereby enhancing the quality of talent cultivation in transportation engineering. Specifically, the significance of the hybrid teaching model reform in transportation engineering courses in the context of smart transportation can be summarized as the following two points:

3.1. Improving teaching effectiveness and student learning experience

In the context of smart transportation, vigorously promoting hybrid teaching reform in transportation engineering courses is of utmost importance and value. It can help improve teaching effectiveness, optimize the student learning experience, and ultimately enhance the quality of talent cultivation ^[4]. In traditional transportation engineering courses, teachers often adopt a simple classroom indoctrination teaching method, where students are in a relatively passive learning position and do not actively explore and create knowledge, leading to poor learning outcomes. Constructing a hybrid teaching model can comprehensively utilize online and offline teaching channels, enhancing students' autonomy in learning. Students can watch related videos of transportation engineering courses, participate in online discussions, and complete online assignments through online channels. This process allows students to preview and review professional knowledge beforehand. In offline sessions, students can participate in offline practical activities and group discussions, transforming the offline classroom into a problem-solving-centered teaching format. This effectively enhances the student learning experience and improves the teaching effectiveness and quality of transportation engineering courses.

3.2. Adapting to the development needs of the smart transportation industry

In the context of smart transportation, China's transportation industry has a growing demand for high-quality talent. However, traditional transportation engineering courses often focus on theoretical knowledge, neglecting to specifically strengthen students' practical skills and innovative literacy. This results in poor talent

cultivation, which is clearly not adapted to the current development trends and talent cultivation needs of the smart transportation industry. Vigorously promoting hybrid teaching content reform can deeply integrate online and offline education channels. It can also incorporate cutting-edge technical knowledge from the smart transportation field into transportation engineering courses, effectively integrating course content with practical transportation projects. This process highlights the comprehensive application of theoretical knowledge in practical projects and enables students to more fully understand and master professional knowledge in transportation engineering courses, deeply grasping the underlying principles and practical application models^[5]. Additionally, promoting teaching reform in transportation engineering courses based on hybrid teaching can facilitate targeted talent cultivation according to the development needs of the smart transportation field. This not only improves the level and effectiveness of talent cultivation but also fully aligns with the development trends and demands of the smart transportation industry.

4. Challenges of hybrid teaching content reform in transportation engineering courses in the context of smart transportation

4.1. Updating teaching content and integrating cutting-edge technologies

In the context of smart transportation, the hybrid teaching content reform in transportation engineering courses faces the challenge of updating teaching content and integrating cutting-edge technologies. Overcoming this challenge becomes a critical factor in determining the quality of education and teaching. With the rapid development of network information technology in China, the field of smart transportation is booming, and various new technologies and concepts are emerging. As a subject closely related to smart transportation, the transportation engineering course must keep up with the pace of the times during the hybrid teaching content reform, integrating industry-tested technologies into teaching. However, the current teaching content has a certain lag and does not incorporate industry-leading technologies and knowledge, making it difficult to effectively promote the orderly progress of hybrid teaching content reform and strengthen the quality and effectiveness of talent cultivation.

4.2. Improving the information technology literacy of the teaching team

To effectively integrate smart transportation expertise into the hybrid teaching content reform of transportation engineering courses, a high-quality teaching team is needed. This requires teachers to not only possess a wealth of information and knowledge but also to have a deep understanding of the development of the smart transportation field and be familiar with the linkage between online and offline teaching. This poses higher requirements on teachers' teaching professionalism. However, in reality, some teachers in colleges and universities have limited understanding and application of new technologies and tools. These teachers are more accustomed to traditional classroom teaching with blackboard writing and are relatively unfamiliar with the use of online teaching platforms and multimedia teaching equipment. This situation makes the hybrid teaching content reform of transportation engineering courses face certain difficulties.

4.3. Enhancing teaching facilities and technical support

In the context of smart transportation, the hybrid teaching content reform of transportation engineering courses faces teaching difficulties brought about by the improvement of teaching facilities and technical support. This is mainly because some colleges and universities often face problems such as incomplete teaching facilities and insufficient technical support, making it difficult to promote teaching reform in an orderly manner^[6]. For

example, some colleges and universities have aging teaching facilities, which makes it difficult to effectively implement the hybrid teaching model. Some classrooms often have outdated multimedia teaching equipment and insufficient network bandwidth, making it challenging to ensure the smooth progress of online teaching and promote teaching reform in transportation engineering courses.

4.4. Cultivating students' self-discipline and learning initiative

In the context of smart transportation, the hybrid teaching content reform of transportation engineering courses faces challenges in cultivating students' self-discipline and initiative, which has become a major difficulty in teaching reform. In practice, the hybrid teaching content reform requires the comprehensive use of online and offline channels to promote teaching. The online learning stage requires students to have stronger self-discipline and actively participate in the learning and exploration of professional knowledge. However, due to students' lack of self-discipline in learning, problems such as inattention and procrastination in online learning may arise. Especially for students with weak self-management abilities, they often fail to concentrate on online learning, making it difficult to achieve good learning results ^[7].

5. Suggestions and countermeasures for hybrid teaching content reform of transportation engineering courses in the context of smart transportation

5.1. Constructing a dynamic teaching content system and integrating the latest knowledge of smart transportation

To effectively promote the reform and innovation of transportation engineering course education, it is necessary to continuously improve the educational model based on the current background of smart transportation, utilizing both online and offline channels to achieve hybrid teaching reform. Therefore, it is important to keep up with the times and continuously innovate in education and teaching. Constructing a dynamic teaching content system and deeply integrating the latest knowledge of smart transportation are crucial measures that can effectively facilitate the reform of hybrid teaching content. Hence, it is essential to actively establish a dedicated teaching content update mechanism, such as regularly reviewing the current teaching content of transportation engineering courses and actively integrating cutting-edge technical knowledge from the field of smart transportation. This ensures that student learning remains synchronized with industry developments, aligning with industry trends and directions ^[8]. Especially in the context of the continuous development and innovation of China's intelligent transportation systems, intelligent driving technology, and big data technology, teachers need to actively integrate this knowledge during the teaching content innovation phase. Through various methods such as case studies and project practices, students are guided to learn and explore, helping them develop a deep understanding of smart transportation and improving the quality of education and teaching.

5.2. Strengthening education and training of the teaching team to enhance information technology literacy and teaching ability

Education and training for the teaching team are crucial, as they can help build a high-quality, professional teaching team to promote the hybrid teaching content reform of transportation engineering courses, aligning education and teaching with social transportation development trends ^[9]. Therefore, it is necessary to vigorously strengthen the education and training of the teaching team, focusing on improving teachers' information technology literacy and teaching abilities. For example, professional training can be regularly organized for teachers to participate in. Through professional training, teachers' information technology abilities can

be enhanced, enabling them to use online platforms to promote teaching and improve their online teaching abilities. Practical training should include knowledge of online teaching platform operations, virtual simulation technology applications, and multimedia teaching courseware production. This ensures that teachers are proficient in online teaching, building a high-quality teaching team to promote the construction of a hybrid teaching model and effectively drive innovation in the teaching content of transportation engineering courses.

5.3. Improving teaching facilities and technical support to ensure smooth implementation of hybrid teaching

In the context of smart transportation, promoting the reform of teaching content for transportation engineering courses also requires significant improvements in teaching facilities and technical support to ensure the smooth implementation of hybrid teaching. In practice, it is essential to ensure adequate online teaching facilities and equipment. Therefore, it is necessary to actively purchase advanced online teaching platforms and multimedia teaching equipment, providing sufficient objective support for teachers to conduct online teaching and meeting students' needs for online learning^[10]. Additionally, it is important to strengthen campus network construction by enhancing network bandwidth and improving network stability. This ensures smoother online learning processes, preventing network environmental issues from affecting students' learning and facilitating the orderly progress of hybrid teaching content reform for transportation engineering courses.

5.4. Strengthening students' self-discipline in learning and stimulating their interest in active learning

The reform of hybrid teaching content in transportation engineering courses also requires students to possess stronger self-discipline and demonstrate good subjective initiative. Therefore, promoting hybrid teaching reform in the context of smart transportation should also focus on strengthening students' interest in learning, so that students can form good self-discipline and actively carry out learning and exploration of transportation engineering courses. Firstly, teachers need to assist students in developing detailed study plans and schedules and regularly organize discussions on professional course knowledge for students. This allows students to learn time management and develop good self-discipline while advancing their learning plans. Additionally, teachers should focus on creating a positive learning environment and atmosphere, such as fostering a positive class atmosphere to motivate students to actively participate in online and offline hybrid learning. This not only drives students to actively learn in a good learning atmosphere but also cultivates their interest in learning, helps strengthen the reform effect of transportation engineering courses, and improves the quality of teaching and educating.

6. Conclusion

In summary, in the context of smart transportation, the reform of hybrid teaching content for transportation engineering courses is crucial. Through this reform, online and offline teaching modes can be deeply integrated, leading students to innovatively learn and explore transportation engineering knowledge. This helps students adapt to the development trend and direction of smart transportation, enabling them to master rich professional knowledge and enhance their professional skills. Therefore, based on the challenges faced by the current reform of hybrid teaching content in transportation engineering, this paper proposed multiple measures, such as building a dynamic teaching content system, cultivating teachers' information technology and capabilities, providing hybrid teaching facilities and technical support, and fostering students' initiative and self-discipline.

These measures aim to facilitate the orderly reform of hybrid teaching content in transportation engineering courses and enhance the quality and effectiveness of talent cultivation.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Hong L, Liu Z, Tang M, 2023, Reform of Mixed Teaching Content for Transportation Engineering Courses in the Context of Smart Transportation. *University Education*, 2023(23): 70–73.
- [2] Lu X, Li T, Wang P, 2022, Exploration and Practice of Mixed Teaching Mode and Evaluation Strategy—Taking the Course of Traffic Engineering as an Example. *Modern Information Technology*, 2022(10): 193–195.
- [3] Xu Y, 2022, Ideas for the Construction of Secondary Vocational MOOCs and Practice of Mixed Teaching—Taking the Course of Introduction to Intelligent Transportation as an Example. *Guangdong Education (Vocational Education)*, 2022(11): 110–111.
- [4] Lv Q, Xiao M, Cheng B, 2021, Exploration of Mixed Teaching Reform for Traffic Engineering Courses in Local Colleges. *Journal of Higher Education*, 2021(20): 131–134, 138.
- [5] Li Y, Li C, Yang Z, 2023, Research on EMI-based Frontier Technology Guided Classroom Teaching Method for “Intelligent Transportation System.” *Logistics Science and Technology*, 46(19): 168–169.
- [6] Cheng D, Wang H, 2023, Research on the Reform of Mixed Teaching Mode Based on the Zhihuishu Platform—Taking the Course “Urban Rail Transit Operation Organization” as an Example. *Modern Vocational Education*, 2023(34): 25–28.
- [7] Ning P, 2023, Exploration and Practice of “Wisdom + Ideological and Political” Classroom Teaching in Vocational Colleges—Taking “Intelligent Construction Technology of Buildings” as an Example. *Journal of Guangdong Communication Vocational and Technical College*, 22(4): 80–84.
- [8] Cheng L, Zhang H, Wang X, et al., 2023, Research and Practice on the Innovation of “Ability-Oriented, Quadripartite Linkage” Material Courses’ Smart Teaching Mode. *Henan Building Materials*, 2023(8): 16–18.
- [9] Zhou S, Tang C, 2024, Dilemmas and Breakthrough Paths Faced by the Teaching of “Urban Road and Transportation Planning” Courses in Smart Transportation. *Science, Education and Culture*, 2024(14): 95–99.
- [10] Pang L, 2024, Exploring Digital Transformation Teaching Strategies in Smart Transportation—Taking the Course of Railway Station Passenger Transport Management as an Example. *Auto Times*, 2024(9): 77–79.

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Analysis of the Complexity and Symbolic Significance of Lensky's Character in *Eugene Onegin*

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Abstract: The character of Lensky in *Eugene Onegin* is one of the most discussed figures in the novel. He is the friend of Eugene Onegin and represents a contradictory personality. In the novel, Lensky displays a complex set of characteristics, appearing both elegant and noble on the outside, while concealing a deep inner loneliness and conflict. His attitude toward love and his dissatisfaction with society make him a dramatic and profound character in the story. By analyzing the character of Lensky, we can explore his role in the novel and his relationships with other characters. Lensky's presence not only enriches the plot but also presents a figure filled with inner contradictions and emotional struggles. His friendship and rivalry with Eugene Onegin, as well as his admiration and helplessness in regard to Olga, showcase his complex inner world and reflections on life. Furthermore, the character of Lensky carries a certain symbolic significance. He can be seen as a metaphor for Russian society and culture at the time. His loneliness and inner conflict symbolize the limitations of Russian society and culture, while also reflecting Pushkin's idealized pursuit of love and friendship, as well as his critical view of reality. In conclusion, through a deep analysis of Lensky's character, we can better understand the portrayal of characters and the development of the plot in *Eugene Onegin*. It also provides readers with a perspective on Pushkin's thoughts and observations on human nature, society, and culture.

Keywords: Character; Analysis; Personality; Symbolic significance

Online publication: April 2, 2025

1. Creation background of *Eugene Onegin*

Written between 1823 and 1831, *Eugene Onegin* is not only one of Pushkin's most significant works but also a foundational piece of Russian realist literature. This novel presents a vast depiction of Russian social life in the early 19th century, introduces the first "superfluous man" in Russian literary history, and, while revealing the mentality of aristocratic youth of that era, raises themes relevant to the social life of that specific historical period^[1]. Beyond being a reflection on the spiritual aftermath of the failed Decembrist uprising, this novel stands as a milestone marking Russian literature's transition from Romanticism to Realism. After the

Patriotic War of 1812, Russian noble officers who participated in the European campaigns were exposed to Enlightenment thought, which gave rise to the liberal Decembrist movement. However, the tragic failure of the 1825 uprising plunged the intellectual class into a collective crisis of “disillusionment.” This became a prevalent social malaise, particularly affecting the intellectual and aristocratic circles. In *Eugene Onegin*, this existential crisis is personified through two contrasting paths: Onegin’s nihilism and Lensky’s idealism. Together, they represent two poles of the spiritual crisis accompanying Russia’s modernization process.

Pushkin deliberately aligned the novel’s timeline (1820–1825) with the period of the Decembrist movement. Onegin’s withdrawal from the social circles of St. Petersburg in the first chapter (1823) coincides with the period when secret societies were active in the northern capital. Meanwhile, Lensky’s death in the winter of 1825 symbolically mirrors both the physical and ideological demise of young noble revolutionaries. The presence of this historical subtext elevates the novel beyond a mere narrative of personal fate, transforming it into a literary record of shifting societal consciousness.

Pushkin’s exile to southern Russia (1820–1824) profoundly influenced the novel’s spatial construction and character development. The untamed landscapes of the Caucasus and the romantic scenery of Crimea not only inspired the natural imagery in Lensky’s poetry but also highlighted the isolation of Russian rural life. Notably, during his exile, Pushkin extensively read Byron and Goethe, and this intercultural influence fostered the formal innovation of the “Onegin stanza”—a meticulously structured 14-line verse form that maintains a dynamic balance between lyricism and narration.

This formal experiment carries dual cultural significance: first, the musicality of the iambic tetrameter continues the Russian poetic traditions of Derzhavin and Zhukovsky; second, its flexible and varied rhyme scheme aligns with the logical structure of Western Enlightenment reasoning. This formal consciousness also provided the technical foundation for shaping Lensky’s character as a poet—his naïve Romanticist poetic style stands in contrast with Onegin’s skeptical discourse, forming a poetic dialogue within the text.

The period during which *Eugene Onegin* was written coincided with Russian literature’s transition from Romanticism to Realism. Pushkin presented this shift within the text through an internal “poetic debate”: Lensky, representing the German Romantic tradition (“a disciple of Kant and Schiller”), indulges in an idealized metaphysical world, whereas Onegin’s Byronic melancholy reveals the sharp rationalism that deconstructs Romantic illusions ^[2]. Their violent clash in the duel serves as a dramatized resolution of these two aesthetic paradigms.

It is also worth noting that Pushkin embedded a reflection on literary creation within the novel itself. Lensky’s love poetry is dismissed by the narrator as “hollow as a child’s babbling” (Chapter 4, Verse 7), a metafictional critique that suggests the author’s awareness of Romanticism’s limitations. Furthermore, Tatiana’s romantic fantasies, shaped by her reading of Richardson’s novels, stand in stark contrast with the reality of her marriage, further deconstructing the Romantic literary tradition’s real-world relevance. This self-referential writing provides a crucial entry point for analyzing Lensky’s symbolic significance—his death is not just a personal tragedy but also a foreshadowing of the demise of the Romantic spirit.

2. Research background and significance

Eugene Onegin is a foundational work by the Russian literary giant Alexander Pushkin. This novel has been widely admired not only for its melodious, poetry-like language but also for its genuine emotional expression, which is the true reason it has captivated countless readers ^[3]. More than just a literary work, this novel serves

as a profound analysis of 19th-century Russian society and human nature. In *Eugene Onegin*, Lensky is one of the key characters, along with Onegin and Tatyana, forming an essential part of this “encyclopedic” depiction of society. Scholars generally interpret his role in two main ways: (1) Characterization: Lensky’s vague and hollow idealism serves as a contrast to Onegin’s existential disillusionment, reinforcing Onegin’s identity as a “superfluous man”; (2) Plot structure: Lensky’s death acts as a pivotal turning point in the narrative, temporarily removing Onegin from the stage and shifting the story’s focus to Tatyana. Thus, many consider Lensky’s role as merely serving to highlight the main characters and facilitate the plot. However, such an understanding is insufficient. Lensky should not be seen merely as a supporting character; rather, he is an intriguing and significant figure in his own right. His character carries profound symbolic meaning and reflects the author’s contemplation of human nature, friendship, and love.

Firstly, analyzing Lensky’s character helps deepen our understanding of Pushkin’s approach to character development and plot construction. As Onegin’s close friend, Lensky exhibits a personality and worldview that contrast starkly with those of the protagonist. Examining his role allows us to better grasp the relationships among characters and their significance within the narrative.

Secondly, the complexity and symbolism of Lensky’s character reflect Pushkin’s keen observations and critiques of Russian society and culture at the time. His loneliness, inner struggles, and pursuit of love and friendship to some extent mirror the moral and ideological void of that era. Through an analysis of Lensky, we can uncover Pushkin’s profound insights into the social and cultural phenomena of his time, as well as his concerns about social reform and moral values.

Furthermore, the study of Lensky’s character contributes to a broader understanding and interpretation of Pushkin’s works. Lensky’s contradictions and complexities are not merely individual traits but also serve as a reflection of broader human nature. By analyzing his character, readers can gain deeper insights into human emotions and existential dilemmas, providing new perspectives for literary research.

In short, an in-depth study of Lensky’s character not only enhances our understanding of the themes and significance of *Eugene Onegin* but also offers valuable insights into Pushkin’s thoughts and observations as a writer and thinker.

3. Lensky’s appearance and personality

The depiction of Lensky’s appearance in the novel is not particularly detailed, but the author indirectly presents his image through various descriptions. He is often portrayed as a tall, handsome, and elegant young man with deep, expressive eyes and jet-black hair. His attire is usually refined yet understated, reflecting his noble background and sophisticated taste. These descriptions establish Lensky as a typical member of Russia’s upper-class society while also hinting at his delicacy and inner elegance.

Lensky’s personality is complex and multi-dimensional. On the surface, he appears calm, graceful, and well-mannered, yet he harbors deep emotions and internal conflicts. His attitude toward friendship and love is marked by contradictions—he is both passionate and reserved, both rational and emotional. As a deeply thoughtful individual, he often contemplates social and existential issues, yet frequently falls into self-doubt and confusion. This complexity makes him one of the novel’s most compelling characters, adding dramatic depth and emotional tension to the story’s development.

4. The relationship between Lensky and Eugene Onegin

Lensky exhibits a complex and subtle emotional attitude toward Eugene Onegin. His feelings for Onegin are not merely those of friendship but also contain elements of admiration and jealousy ^[4]. In the novel, he frequently expresses confusion and skepticism regarding Onegin's actions and choices, yet he continues to maintain trust and respect for him. Lensky's emotions are conveyed not only through direct words but also through his actions and implicit gestures.

Eugene Onegin harbors equally complex feelings toward Lensky. While he regards Lensky as a friend, he often finds himself puzzled by his behavior and ideas. Though he is occasionally drawn to Lensky's noble and profound character, he is unable to fully understand his inner world. Onegin's attitude toward Lensky is a mix of respect and a certain degree of detachment.

As the story progresses, the relationship between the two characters undergoes dynamic changes. Initially, their friendship appears solid, but over time, it grows increasingly intricate. Lensky and Onegin are frequently analyzed as contrasting figures ^[5]. The novel explicitly states that they are "more different than rock and wave, ice and flame, poetry and prose, never sharing the same opinion on anything." However, just as no two leaves are exactly identical, it is equally unrealistic to find two completely opposite leaves. This exaggerated contrast is, in fact, a literary device that conceals a deeper truth: Onegin sees in Lensky a reflection of his own younger self.

Onegin's choices and actions often leave Lensky feeling perplexed and disappointed, while Lensky's independent thoughts and decisions prompt Onegin to engage in self-reflection. Their relationship is characterized by both conflict and mutual understanding, and their interactions add significant dramatic tension and emotional depth to the story.

By analyzing the intricate relationship between Lensky and Onegin, readers can gain a deeper understanding of their emotional exchanges and interactions. This also encourages reflection on themes of friendship and human relationships, which play a crucial role in the novel's emotional development and character arcs.

5. The complexity of Lensky's character

The complexity of Lensky's character is one of the most captivating aspects of his portrayal by Pushkin. He is not merely an individual figure but also a representation of the struggles and contradictions faced by 19th-century Russian society. His internal conflict between idealism and reality mirrors the aspirations and frustrations of young people of his time. Lensky embodies both an idealistic vision of society and dissatisfaction with the harsh realities of life, making his character both compelling and deeply relatable ^[6].

Firstly, Lensky's awareness of social injustice reveals his desire for societal change. He observes the divisions between social classes, the corruption of power, and the moral decline of the aristocracy with profound discontent. Yet, at the same time, he feels powerless in the face of such injustices, believing himself too insignificant to effect meaningful change. This disparity between ideals and reality often leads him into painful self-doubt, adding authenticity and emotional weight to his character.

From another perspective, Lensky's complexity is also evident in his search for meaning in life. In his relationships with others, he exhibits both rational thought and an overly idealistic, emotional approach. His unwavering loyalty to his friends and his passionate devotion to love demonstrate his longing for close relationships, but his idealistic expectations also bring him distress. His indecision and contradictions in personal interactions further highlight his internal conflicts.

Moreover, Lensky's character reflects the profound influence of his historical era on the individual. In 19th-century Russia, young intellectuals were heavily influenced by Enlightenment ideas and Romanticism, fostering a growing sense of individual consciousness. However, the oppressive realities of society stifled personal aspirations. This tension runs throughout Lensky's life, adding layers of complexity to the novel's themes. His eventual fate—choosing self-sacrifice—represents both a sense of responsibility toward society and a tragic recognition of his inability to change the world.

Overall, Lensky is a multidimensional and well-developed character. He is both an idealist and a tragic figure crushed by reality^[7]. His internal struggles and reflections not only make him a deeply human character but also serve as a medium through which Pushkin explores themes of human nature, society, and existential dilemmas. Lensky's complexity ensures his lasting influence in literary history as one of the most thought-provoking figures in Russian literature.

6. The symbolic meaning of Lensky's character

Lensky's character in *Eugene Onegin* serves as a powerful symbol, representing the new generation of Russian aristocratic elites. His significance extends beyond his personal fate, he embodies the values, struggles, and aspirations of Russia's upper-class youth^[8]. As a noble-born intellectual, Lensky is more than just a character; he is a symbol of societal ideals and contradictions. His internal turmoil and pursuit of higher ideals reflect a deep yearning for freedom and justice, serving as a critical reflection on contemporary social realities. Furthermore, Lensky represents the hopes and frustrations of young Russians of his time, with his struggles mirroring the broader existential dilemmas faced by his generation.

Lensky's character is closely intertwined with Russian society and culture. As a member of the aristocracy, his manners, behavior, and values reflect the lifestyle and worldview of Russia's elite class. However, his internal conflicts and aspirations also highlight the broader societal tensions between tradition and progress, idealism and pragmatism. His experiences and fate provide a microcosm of 19th-century Russian life, offering insights into the cultural and historical landscape of the era^[9]. Through Lensky, Pushkin critiqued the stagnation and moral decline of the aristocracy while also exploring the challenges faced by a generation striving for change.

Lensky's character provides readers with valuable insights into Russian society and culture. His personal struggles serve as a reflection of Pushkin's keen observations on human nature and social conditions. At the same time, his story encourages readers to reflect on themes of self-awareness, social responsibility, and the limitations imposed by societal structures^[10]. By analyzing Lensky's character in depth, readers gain a deeper understanding of the cultural and historical backdrop of *Eugene Onegin*, as well as Pushkin's broader philosophical and social concerns.

Lensky's character prompts contemplation on themes such as morality, human weaknesses, and the unpredictability of fate, adding profound layers of meaning to the novel. His story not only enriches the literary experience but also offers readers a thought-provoking exploration of the human condition.

By delving into the symbolic significance of Lensky's character, we can better appreciate Pushkin's approach to character development and storytelling. At the same time, Lensky's portrayal provides a valuable perspective on Russian society and culture, making him an indispensable element of *Eugene Onegin*.

7. Conclusion

This paper provides an in-depth analysis of Lensky's character in *Eugene Onegin*, exploring his appearance, personality, relationship with Onegin, and symbolic significance. While Lensky appears elegant, he struggles internally with contradictions, caught between ideals and reality. His friendship with Onegin is both harmonious and conflicted, driving the story forward. As a representative of Russia's new elite, Lensky embodies Pushkin's reflections on idealism, freedom, and social realities. Through this study, we deepen our understanding of Pushkin's work and its cultural significance, offering new perspectives for Russian literary research.

Disclosure statement

The author declares no conflict of interest.

References

- [1] Peng Z, 2000, Eugene Onegin: Analysis of the Narrator's Image. *Foreign Literature*, (02): 111–113.
- [2] Lei H, 1994, On Lensky—Pushkin's Reflections on Romantic Literature. *Journal of Sichuan Normal College*, 1: 41.
- [3] Liu M, 2014, Interpretation of Character Images in Eugene Onegin. *Language Construction*, (35): 52.
- [4] Wang L, 2012, Past, Present, and Future—An Analysis of the Inner Relationship Between Onegin, Lensky, and “I.” *Northern Literature (Second Half)*, 8: 247.
- [5] Zhang Y, Wang Z, 2022, The Contradictory Archetype of Love Narrative in Eugene Onegin. *Journal of Hebei University (Philosophy and Social Sciences Edition)*, 47(06): 79–86.
- [6] Zhu Y, 2025, Interpretation of Eugene Onegin from the Perspective of Bakhtin's Chronotope Theory. *Journal of Harbin University*, 46(02): 73–76.
- [7] Wu Z, 2024, Superfluous Man and Dreamer—A Comparative Study of the Male Protagonists in Eugene Onegin and White Nights. *Yangtze River Novel Appreciation*, (25): 31–34.
- [8] Zhong J, 2023, The Reception of the “Eugene Onegin” Image in Modern Literary History, dissertation, Changchun University of Science and Technology, 12–18.
- [9] Li X, 2020, A Study on Intertextual Techniques in Eugene Onegin. *Journal of Language and Literature*, 40(06): 84–91.
- [10] Wu P, 2019, On the “Superfluous Man” Eugène Onegin. *Literary Education (I)*, (11): 46–47.

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Research on the Path of Integrating Artificial Intelligence into Ideological and Political Education for College Students

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Abstract: The rapid development of artificial intelligence technology has brought profound opportunities for transformation to ideological and political education in colleges and universities, while also triggering multidimensional challenges. This article analyzes the four dimensions of intrinsic logic, value implications, risk challenges, and response strategies, exploring how artificial intelligence technology reshapes the practical model of ideological and political education and how to adhere to the essence of education in the empowerment of technology, and proposes systematic solutions, with the aim of providing theoretical support and practical reference for the innovation of ideological and political education in the new era.

Keywords: Artificial intelligence; Ideological and political education; Path

Online publication: March 27, 2025

1. Introduction

In the new era, artificial intelligence, along with the widespread application of educational digitization, is gradually transforming the practical field of ideological and political education in colleges and universities, injecting new momentum into its transformation and innovation. How to effectively integrate artificial intelligence technology into the ideological and political education system in colleges and universities, realizing the modern transformation of the education model and the in-depth improvement of education quality, has become a key issue in the new era. Therefore, it is necessary to clarify the internal logic, value implications, and risks and challenges of the combination of artificial intelligence and ideological and political education, to build a practical path for the combination of artificial intelligence and ideological and political education, and to provide useful ideas and directions for maintaining innovation in ideological and political education.

2. The intrinsic logic of integrating artificial intelligence into ideological and political education for college students

2.1. The diversification of the educational subject and the integration of human and machine

The traditional model of ideological and political education primarily focuses on one-way transmission, with educators taking the lead in content planning, instructional design, method selection, and evaluation implementation. The modern model shifts towards two-way interaction, emphasizing equality and autonomy between educators and learners and establishing a new type of educational relationship based on mutual subjectivity, which enhances the quality and efficiency of teaching. Artificial intelligence technology promotes in-depth interaction between the subject and object in ideological and political education at universities, with students, as the core object, no longer merely passive recipients but becoming participants, experiencers, and feedback providers in the educational process. Both parties in education grow together in symbiotic interaction, becoming promoters of communication and interaction. At the same time, the application of digital technology breaks down time and space constraints, achieving seamless human-computer integration and deep fusion, leading to a transformation in the ecosystem of ideological and political education and presenting a new situation of “human-computer symbiosis, everything connected.”

2.2. The segmentation of the educational process and intelligent guidance

The “uniform indoctrination” strategy in traditional ideological and political education often overlooks individual differences among students, failing to effectively follow the value transformation trajectory from acceptance to internalization and then to externalization. In contrast, intelligent ideological and political education can leverage digital technology to shift the educational process from traditional experience-driven to data-driven ^[1]. The combination of artificial intelligence technology with targeted strategies has propelled a new transformation in the educational process. By analyzing data and constructing learner profiles, teachers can meet the individual needs of students, gain real-time insights into students’ thoughts and behaviors, and deliver customized educational content and teaching methods. This mechanism effectively stimulates students’ enthusiasm for learning. Moreover, intelligent guidance, through technologies such as emotional recognition and scenario simulation, enhances the interactivity and precision of education. Customized teaching methods provide detailed guidance at critical growth junctures, paving the way for differentiated and refined strategies in ideological and political education. These two aspects demonstrate the integration of educational technology innovation with humanistic care, amplifying the impact of education through digital technology.

2.3. The simulation of the educational scenario and the three-dimensional perspective

Education is not an environment of its own, but an environment that has been transformed with a specific mission. Artificial intelligence, with its powerful computing power, data processing technology, and advanced voice and image recognition technology, converts static ideological and political course knowledge into dynamic digital content, building a highly simulated virtual educational environment for teachers and students ^[2]. This simulation is not limited to the physical space but extends to the reproduction of multi-dimensional situations such as society, history, and culture. Educators use advanced technologies such as virtual reality and augmented reality, cleverly integrating cognitive auxiliary tools, rich technological resources, and multimedia elements, supplemented by an emotionally rich atmosphere, carefully constructing “immersive” and “multi-dimensional” teaching situations, creating a learning environment that feels like being there for students, narrowing the distance between the educational object and the narrative object in the form of spatial text, greatly enhancing

the appeal and persuasiveness of ideological and political education. The simulated educational scenario makes the content of ideological and political education more prominent, allowing students to experience in practice and gain insights through experience, expanding the breadth and depth of ideological and political education through the reproduction of virtual scenarios. The construction of a three-dimensional perspective promotes the sharing, connection, and cohesion of educational resources, providing strong support for building an all-process and all-around educational pattern with cross-domain presence and cross-border collaboration, leading a new paradigm of ubiquitous learning characterized by universality, sociality, flexibility, and connectivity.

3. The value implication of integrating artificial intelligence into ideological and political education for college students

3.1. Precision education: From “flood irrigation” to “precision drip irrigation”

Through big data analysis, machine learning, and other technologies, artificial intelligence can collect data on students' thoughts, emotions, behaviors, and other aspects in real time, build a “digital portrait,” and accurately identify individual needs. For example, by analyzing students' online behavior and classroom feedback, AI can recommend customized learning content to achieve accurate matching between educational content and needs. This “targeted education” mode breaks through the traditional “one-size-fits-all” teaching limitations and significantly improves the effectiveness of education.

3.2. Resource integration: Building an educational ecology integrating virtual and real conditions

Artificial intelligence technology promotes the expansion of educational resources from a single entity space to the “intelligent field” of the combination of virtual and real. Virtual reality (VR) technology can restore the red historical scene and enhance students' immersive experience; the intelligent ideological and political platform can integrate high-quality resources inside and outside the school to form a “big curriculum system.” For example, through the “classroom on the air” breaking through the time and space restrictions, students can have access to diversified learning resources at any time.

3.3. Model innovation: Enhancing teaching efficiency under human-machine collaboration

Artificial intelligence assists teachers in data collection, student situation analysis, and effect evaluation, freeing up teachers' energy to focus on high-level tasks such as instructional design and emotional guidance. For example, an intelligent evaluation system generated by artificial intelligence can quantify teaching effectiveness, helping teachers dynamically adjust their teaching strategies and form a positive interaction of “human-machine collaboration.”

3.4. Value guidance: Integrating scientific and technological empowerment and humanistic care

Artificial intelligence technology converts abstract theories into concrete content (such as animations and interactive cases) through multimedia forms to enhance students' cognitive identity. At the same time, its data-driven characteristics help to strengthen the communication efficiency of socialist core values. For example, they recommend the content of the theme through algorithms and subtly shape students' values.

4. The risk and challenges of integrating artificial intelligence into ideological and political education for college students

4.1. The impact of instrumental rationality on the essence of education

Dependence on artificial intelligence may lead to education becoming a “data game,” with algorithmic recommendations potentially exacerbating the information cocoon and weakening critical thinking. If the evaluation system focuses solely on quantitative indicators, it may overlook implicit dimensions such as emotions and values. Students’ acceptance of artificial intelligence varies, with some holding negative attitudes. After the introduction of artificial intelligence, the role of teachers needs to change, focusing on the student learning process. This requires teachers to possess educational skills, and students need to have the ability for autonomous and collaborative learning. The prospects for the application of artificial intelligence in education are broad, but social acceptance is key. The novelty and complexity of the technology may cause resistance and concern, making government policy support crucial.

4.2. The alienation of the relationship between teachers and students and the weakening of the subjectivity

The intervention of artificial intelligence may weaken teachers’ dominance and reduce interaction between teachers and students. With the replacement of virtual teaching assistants, the emotional connection between students and teachers may be diluted. Moreover, students’ reliance on artificial intelligence tools could hinder their ability to think independently. While artificial intelligence and the integration of ideological and political education in colleges and universities offer many conveniences for both educators and learners, they also inevitably subject all teaching activities to the rationality of intelligent programs. The virtualization characteristics of intelligent tools can overshadow individual rational thinking, shaping perceptions of people and objects based on the utility-driven design of artificial intelligence. This shift may lead to an overemphasis on artificial intelligence’s utility, resulting in a deviation from the rational practice of ideological and political discourse. Consequently, the sincerity and authenticity of educational discourse between educators and students may be compromised, leading to a certain degree of informational overload ^[3].

4.3. Data ethics and privacy and security risks

Large-scale data collection involves students’ privacy protection issues. If the data is improperly managed, it may cause information leakage or abuse. Artificial intelligence systems that do not follow the “minimum necessary principle” may overcollect sensitive information and even be used for non-educational purposes. In the field of ideological and political education, the improper application of artificial intelligence technology may lead students to accept the wrong values and may even be exploited by specific interest groups. The application of artificial intelligence in education relies on the support of large amounts of data, which requires educational institutions to collect and process large learning data sets. However, this process inevitably touches on the sensitive issues of personal privacy protection and data security. From the perspective of humanism, the special nature of ideological and political education of college students has brought challenges to the integration of artificial intelligence technology. The field of education involves core elements such as values, ideology, and ethics, and the intervention of artificial intelligence technology may cause interference or impact on these elements.

4.4. Displacement of technology application and educational demand

Some universities have blindly introduced artificial intelligence technology, leading to “intelligence for the

sake of intelligence.” Certain intelligent systems have redundant functions and complex operations, which instead increase the burden on teachers; the conceptual differences between technology providers and educators may also lead to a disconnect between tool design and actual needs. In universities, ideological and political education and artificial intelligence technology belong to different academic fields, and the current talent cultivation system has not yet achieved effective integration of the two^[4]. Managers and teachers of ideological and political education find it difficult to master artificial intelligence technologies such as data analysis and structured and visualized data profiling in the short term, and these skill gaps limit the integration of artificial intelligence with ideological and political education. The lack of compound talents with a background in ideological and political education and the ability to apply artificial intelligence technology also constrains the integration process. In addition, the formulation of technical standards is an issue that needs to be considered in the integration process. Although China advocates the application of artificial intelligence technology in higher education, a specialized technical standard system has not yet been formed.

5. The realistic path of integrating artificial intelligence into ideological and political education for college students

5.1. Strengthening the essence of education: Balance between instrumental rationality and value rationality

A people-oriented approach has been emphasized, with technology serving as an auxiliary tool. The auxiliary nature of artificial intelligence tools must be clearly defined to ensure that they do not surpass educational objectives. Algorithm design should be guided by teachers to align recommended content with the goals of ideological and political education. An emotionally intelligent system should be developed, incorporating artificial intelligence tools with emotion recognition capabilities. By utilizing natural language processing technology, students’ emotions can be detected, and timely psychological counseling can be provided. Through the study of professional literature, participation in academic activities, and engagement in relevant courses, teachers’ understanding of artificial intelligence can be enhanced. Proficiency in data structures, machine learning, and other related fields should also be acquired. Additionally, AI tools such as recommendation systems and Q&A systems should be effectively utilized to process information and data in ideological and political education. To support this, professional training for ideological and political educators should be offered by colleges and universities. Certification programs should be implemented to establish a qualified team of educators proficient in artificial intelligence technology and its practical applications.

5.2. Optimizing technology application: Accurate demand and dynamic adaptation

A “demand-technology” matching mechanism should be established. Educational challenges must be identified through research, and appropriate artificial intelligence tools should be selected accordingly. For theoretical courses that may be perceived as unengaging, VR technology should be implemented to enhance immersive teaching experiences. A robust data governance framework must be established. Data collection standards should be formulated, while privacy security should be ensured through anonymous processing and encryption transmission technologies. A third-party supervision mechanism should be introduced to prevent data misuse. To achieve deep integration between artificial intelligence and ideological and political education, the digital transformation of educational resources must be advanced. The primary focus should be on producing and sharing high-quality digital content while ensuring its accessibility.

Collaboration between universities and professional institutions should be promoted to develop a digital

content platform. Furthermore, the digital teaching process should be strengthened by building both teaching management and online learning platforms. Artificial intelligence technology should be integrated into these platforms to cultivate a habit of usage among teachers and students. At the same time, special attention must be given to data security. As digital ideological and political education resources are developed, the risks of hacker attacks and data breaches may be encountered. To mitigate these threats, artificial intelligence education security must be enhanced from the perspectives of policy, law, and technology, ensuring that teachers and students can utilize digital resources safely.

5.3. Improving the main body ability: The two-way empowerment between teachers and students

A team of “intelligent literacy” teachers should be cultivated. Training in artificial intelligence technology is conducted to enable teachers to master human-machine collaboration skills. The use of artificial intelligence by teachers is facilitated for analyzing learning situations, designing personalized teaching plans, and stimulating students’ subjectivity. Through artificial intelligence interaction debates and virtual practice projects, students are guided to think actively and avoid cognitive inertia caused by technological dependence.

Familiarity with modern science and technology should be ensured among teachers, allowing technology to be applied rationally while maintaining a people-oriented approach. The role of technology should be optimized to create a positive educational environment. In colleges and universities, teacher training programs should be strengthened to enhance both technical literacy and professional educational competence. Professional training courses, teacher exchange activities, and other initiatives should be organized to promote the overall quality of educators.

Close attention should be paid to the development trends in artificial intelligence technology to ensure that teaching content and methods are updated in a timely manner to align with contemporary advancements. Collaboration between universities, technology companies, and research institutions should be reinforced to jointly promote AI education. Through such partnerships, universities can access the latest technology and educational resources, while technology companies and research institutions can transform research findings into practical applications.

Moreover, deeper exploration and integration of ideological and political education content with artificial intelligence technology should be undertaken to achieve educational objectives. The training and education of both educators and students should be strengthened to enhance their proficiency in using artificial intelligence education platforms and tools while preventing potential risks and challenges. The deep integration of ideological and political education with artificial intelligence should be prioritized, ensuring that excessive technological intervention is avoided and that the humanistic essence of education is preserved.

Teachers should actively acquire modern scientific and technological knowledge, including artificial intelligence. Simultaneously, the appropriate application of technology in ideological and political education should be emphasized, avoiding overreliance on technology and the superficial pursuit of technological effects. A people-oriented approach should be maintained, ensuring that technology serves as an auxiliary tool rather than a replacement, thereby fostering a positive ideological and political education environment.

5.4. Improving the institutional guarantee: The establishment of ethical norms and long-term mechanisms

Ethical guidelines for artificial intelligence education should be developed, with clear boundaries set for

technology application, prohibiting the use of artificial intelligence for student behavior monitoring or value scoring. A multi-party coordination mechanism should be established, where the government, universities, and enterprises collaboratively formulate technical standards, create “artificial intelligence + ideological and political” industry-university-research platforms, and promote the deep integration of technological research and educational needs.

Universities should establish data protection mechanisms to ensure the security of learning data and personal privacy. From a technical perspective, data should be anonymized, managed, and regulated. Education administrative departments should enhance the management system, define their responsibilities, and support the application of artificial intelligence in educational innovation. Relevant legislation and regulatory mechanisms should be continuously updated to standardize the use of artificial intelligence in ideological and political education, ensuring fairness and safety in the educational process.

Additionally, students should receive guidance and supervision to cultivate their ability to identify information and prevent exposure to misinformation. Ethical and legal considerations should be emphasized to ensure that innovative models remain lawful and compliant. Policy guidance and management norms should be improved to stimulate educators’ enthusiasm for innovation and promote the sustainable development of artificial intelligence in ideological and political education. Collaboration with policy departments should be strengthened to refine policies, integrating general education with professional knowledge to enhance practical application capabilities.

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References

- [1] Ding H, Nie L, 2024, An Analysis of the Ideological and Political Education of College Students Empowered by Artificial Intelligence. *Party Building and Ideological Education in schools*, (8): 72–74.
- [2] Kong J, 2024, Class ChatGPT Enables the Emergence Situation, Realization Mechanism and Effective Path of Ideological and Political Course Teaching in Colleges and Universities. *School Party Building and Ideological Education*, (13): 56–59.
- [3] Zheng Q, Li Q, Cheng X, 2024, Artificial Intelligence Drives Forward the Reform of Ideological and Political Education: Logic, Trend and Strategy. *Educational Theory and Practice*, (15): 31–36.
- [4] Sun C, 2023, Innovation of Ideological and Political Education for College Students in the Era of Artificial Intelligence. *Data*, (2).

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Artificial Intelligence and Children: The Application of AI Devices in Preschool Education

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Abstract: As an important result of the development of digital science and technology, artificial intelligence (AI) technology has penetrated all aspects of preschool education, bringing unprecedented changes to children's learning and development. Based on the current situation of preschool education, the article analyzes the characteristics of the application of AI equipment in children's preschool education, and points out that the value of its application is mainly manifested in enriching the form of play in preschool education, improving the acceptance of students, enhancing the pertinence of preschool education based on big data prediction, and enriching the means of education for special children. Under the background of the rapid development of AI technology, the article puts forward countermeasures for the development of children's education in the era of AI, adheres to the bottom-line principle of protecting children, and forms a good AI application scenario based on children's needs. To further cultivate children's AI literacy and strengthen the depth of AI application in preschool education, this article helps the users of preschool education to apply AI more effectively and achieve quality improvement of preschool education.

Keywords: Artificial intelligence; Preschool education; Exceptional children; Educational methods

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1. Introduction

Childhood is an important and sensitive period in human development. During this period, children gain life support. The plasticity of their brains makes them more susceptible to the influence of the external environment. Artificial intelligence (AI), as the latest product of the development of information technology, is the superimposed emerging body of many factors in the social environment, which impacts children's brain development and growth^[1]. With the development of deep learning, there is an increasing application of AI models in the field of preschool education. They can perform more complex tasks, making preschool education more interesting and scientific. However, historical experience shows that any advanced technology has both positive and negative characteristics^[2]. How to use AI well in the field of preschool education and promote the long-term development of children is a problem worthy of in-depth consideration.

2. Characteristics of AI application from the perspective of child developmental psychology

At present, there are various AI devices in our family environment and kindergarten environment. Children's cognition of AI devices has made progress in all aspects, but how children view AI devices is still a problem worthy of further discussion. With the deepening of children's contact with AI technology, their cognition of technology will also be more thoughtful and nuanced ^[3]. Human infants and toddlers are born in an environment with rich social relationships, and AI devices show lifelike characteristics, making them different from traditional machines. In other words, existing research suggests that AI is widely regarded as a social existence for children. Most children's first impression of an intelligent robot is that it is a living creature with a humanoid appearance, the ability to move spontaneously, and intelligent reactions, and children tend to think that it is "alive." In the case of prolonged contact with AI robots, children may project emotional states, intentionality, and morality into AI devices, tend to form intimate relationships with these devices, and even develop attachment. Some social surveys show that children will establish a good interactive relationship with social robots with rich facial expressions and voice emotions and look at robots with the same eyes as they look at humans ^[4].

3. Application scenarios of AI devices in preschool education

Currently, the development of artificial intelligence equipment has entered a new stage, which cannot be ignored ^[5].

3.1. Integration of AI devices into transformative games

Applying AI technology to preschool education can give full play to the advantages of AI technology in life and transform boring knowledge into game forms that infants and toddlers enjoy, making them more immersed in preschool education ^[6]. Since AI technology can form a good interactive mode and fully mobilize children's various emotions, the use of AI technology to build a game mode can better touch children's minds. For example, the use of fingers and gestures to form an immersive experience allows children to enjoy the game in the process of cooperation and learning and form a unique development in interpersonal interaction and human-computer interaction, which can become a source of happiness for children ^[7].

3.2. Children's behavior evaluation and prediction

AI-enhanced predictive models and big data analysis have become the two main types of data mining systems. On the one hand, as a subset of AI, a predictive model is machine learning based on historical data and existing data to predict the likelihood of a certain result. On the other hand, big data analysis is based on the extensive collection of management and analysis data by AI systems, which is more efficient than traditional big data and AI systems ^[8]. It can help AI devices obtain higher quality education data, carry out children's face recognition, and record children's interaction. These data are incorporated into electronic files in richer forms such as images, videos, and voices, so as to facilitate teachers to form long-term chain observation of children. Teachers can also use these data to evaluate children's behavior and present them to parents in a more systematic and dynamic manner during home communication and parents' open days. With AI vision technology as the technical support, kindergartens can build a front-end detection technology motion capture system to understand the movement posture of different students, and effectively analyze children's movement perception level based on real-time observation of movement data on large screens. This intelligent monitoring greatly reduces the

teaching burden of kindergarten teachers ^[9].

3.3. Application of AI equipment to the education of special children

AI technology is widely used in clinical and educational support settings, especially in the field of preschool special education. Children with special needs need to achieve integrated education by improving existing methods and environments, and AI's technical assistance will bring revolutionary improvements. Studies have shown that robotics can help blind children, children with mobility disabilities, and children with autism. In the field of preschool special education, robots can also be utilized in various roles, such as providing therapeutic assistance and facilitating disability detection and monitoring. This is achieved by recording data on children with special needs for diagnosis by clinicians or therapists, employing machine learning models developed for the automatic identification of different types of physical activity in some children with special needs, and applying machine learning methods that process accelerometer data to identify children with special needs. Specific applications include an AI device that correctly distinguishes preschoolers with autism spectrum disorder (ASD) from typically developing children through kinematic analysis of a simple reach down task, helping to identify a well-defined subset of patients and reducing clinical heterogeneity within a broad range of behavioral phenotypes. AI-assisted early detection and diagnosis systems have also been shown to help screen and diagnose ASD in children, such as AI-based robots for the treatment and education of children with autism through facial scanning patterns, using the Support Vector Machine with data-driven feature extraction to identify children with ASD, which is considered a valuable tool for the education or treatment of children with autism.

AI has great potential to support children with special education needs both inside and outside the classroom through interactive design to increase engagement, provide personal feedback, and adapt these children to education. Assistive technologies range from low-tech devices, such as modified keyboards, to AI-fused high-tech solutions, such as screen readers and assistive listening systems, which are essential for children to overcome learning disabilities. Assistive devices are also beneficial for students with intellectual disabilities and children with Down syndrome, helping to develop skills such as numbers, speech, language, memory, and social interaction. Through innovative tools such as machine and deep learning, generative artificial intelligence, and interactive voice response, AI offers more possibilities for early detection, diagnosis, and treatment of children with special needs, providing an exciting pathway for better preschool education for them ^[10].

4. Effect analysis of the application of AI equipment in preschool education

4.1. Enhancing children's adaptive cognitive development

AI equipment helps to promote children's personalized learning and adopt their own special learning paths. Based on deep learning systems, AI equipment can analyze children's cognitive levels in real time and dynamically adjust the difficulty of learning content. For example, in the mathematical enlightenment for children aged 3 to 6, the AI system can continuously assess children's number perception ability through gamified interaction. When it detects that children have gradually mastered addition and subtraction within five years, the system will automatically push the number line tabs for advanced game training, so as to facilitate children to deepen the acquisition of addition and subtraction rules. In addition, AI equipment can also push all kinds of intelligent teaching aids through multi-modal perception training and start cross-sensory learning. For example, real-time social interaction with virtual scenes on the screen through physical digital blocks allows children to exercise their hands-on ability, spatial imagination ability, and hand-eye coordination ability. This

kind of multi-modal perception is more conducive to children's accumulation of learning habits, finding the most suitable learning path for themselves, and forming more effective cross-sensory exercises ^[11].

4.2. Promoting the transformation of language intelligence cultivation methods

The real-time voice feedback mechanism built by AI devices and the bilingual neuroplasticity development mechanism have played a transformative role in the cultivation of language intelligence in the preschool education stage.

4.3. Improving children's social-emotional intelligence

AI devices have significant advantages in microexpression recognition, and smart mirrors equipped with facial emotion recognition systems can provide timely feedback on children's emotional states. When it detects a frustrated expression in a child, the device will initiate a guidance program, such as "You look a little worried. Would you like to take a deep breath?" After more than 12 weeks of training, the device can improve the child's emotional regulation ability by more than 35%. In addition, smart devices can also play a virtual social sandtable. For example, the meta-universe education platform can create safe social scenarios, simulate peer conflict situations, and guide children to seek solutions in practice. According to the survey, children's empathy in real communication can be significantly improved after virtual social sandtable training, which can help children enhance social emotional intelligence, promote the development of children's social level, help children solve conflicts and problems in the real world, and improve children's psychological adjustment ability ^[12].

5. Review and outlook of the application of AI devices to preschool education

5.1. Strengthening the protection of children's rights and interests

The risk posed by technology is a common problem in education technology, especially where participation is prioritized over risk to educational value ^[13]. Developers and users of AI devices are more concerned with how long children use the application and how active they are rather than how much knowledge they acquire ^[14]. This may lead to excessive gamification and superficial learning of children when using AI devices. For example, the application of AI devices in the children's play scenarios mentioned above and the higher level of big data prediction have demonstrated a powerful ability to track children's data. However, these applications have the potential to compromise the privacy of children, who are often unaware that their interactions with these smart devices are being recorded and stored. The ability of parents or others to access and extract information without children's knowledge can affect the protection of children's rights. Moreover, children's brains have strong plasticity, and their adaptation to AI devices is developing ^[15]. Therefore, in the process of applying AI devices to preschool education, it is necessary to always stand in the perspective of children's rights and interests protection, reduce the physical and mental harm caused by the use of AI devices to children, protect children's privacy and security, and avoid the expansion of the digital divide in education and moral violations ^[16].

5.2. Cultivating children's AI literacy

Children's understanding of technology is constantly developing in depth ^[17]. Although children gradually begin to master abstract and advanced descriptions around the age of 12, with the increasing use of AI devices by children, improving children's AI literacy in early childhood is considered beneficial to children's development, so as to justify the introduction of AI literacy training activities from preschool ^[18]. It can further improve children's data analysis ability and help children cooperate with others to solve problems. The early cultivation

of AI literacy will bring many social skills, language analysis skills, and cognitive abilities to children. In the age of digital intelligence, children growing up scientifically have been shown to be more likely to use digital tools to support their social behavior^[19]. In the early stages of children's development, especially in kindergarten, the family, society, and the kindergarten work together to guide children to understand and use AI and change their lives, which can further promote children's development. The world's first Student AI Competency Framework released by UNESCO in 2024 highly recognizes the importance of cultivating children's AI qualities. In the future, we need to further explore and establish AI literacy courses, develop corresponding knowledge maps for children, guide children to correctly understand, use, and scientifically evaluate AI, establish the necessary scope of AI application, and reevaluate the AI teaching process from the above key points^[20].

6. Conclusion

With the rich application of AI equipment in the field of preschool education, we need to further enhance the depth of AI application in preschools and expand its application forms in the future. It is important to innovate the methods of AI participation in preschool teaching, strengthen the depth of AI equipment application, and explore the deep integration of AI equipment and preschool education. We also strengthen data training, improve the level of privacy management, strengthen theoretical learning and ethical management, and further accelerate the iteration of AI equipment, so as to promote the integration of AI in the field of preschool education and achieve leapfrog development.

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References

- [1] Zhang Y, Fang L, 2025, AI and Children: Application of Artificial Intelligence Devices in Preschool Education. *Journal of Qilu Normal University*, 40(01): 49–56.
- [2] Gao H, Song G, Chang X, 2025, Construction of Kindergarten Teachers' Intelligent Educational Literacy Index System in Digital Transformation. *Journal of China Women's University*, 37(01): 74–85.
- [3] Zheng Y, Zhang G, Sun C, 2024, Challenges of Talent Cultivation in Preschool Education in the Era of Artificial Intelligence. *Journal of Kaifeng Vocational College of Culture and Art*, 44(06): 69–73.
- [4] Liu X, Peng H, Zhang Y, 2025, Realistic Challenges and Coping Paths of Preschool Teachers' Intelligent Educational Accomplishment Improvement from the Perspective of AI-TPACK Theory. *Journal of Xinyang Normal University (Philosophy and Social Sciences Edition)*, 45(01): 94–102.
- [5] Wang X, Lin Z, Zheng X, et al., 2024, The Current Situation and Improvement Strategies of Intelligence Literacy of Preschool Education Normal Students. *China Educational Technology Equipment*, (22): 93–97.
- [6] Li D, Chen L, 2024, Application of Educational Robots in Kindergartens under the Background of Artificial Intelligence: Opportunities and Challenges. *Journal of Fujian University of Education*, 25(11): 98–101.
- [7] Xi Y, Zhao X, 2024, Research on Parametric Fusion Tracking Control Model in Preschool Robot Behavior Trajectory Planning. *Automation & Instrumentation*, (09): 239–243.
- [8] Liu X, 2024, Legislation on Artificial Intelligence Education: A systematic Codification Approach Based on Education Code. *Modern Distance Education Research*, 36(05): 61–71 + 82.

- [9] Li H, 2024, The Advantages, Principles and Strategies of Cultivating Talents for Preschool Education with Artificial Intelligence. *Journal of Luohe Vocational and Technical College*, 23(05): 56–61.
- [10] Gu M, 2024, Educational Reform and Innovation in the Era of “Artificial Intelligence +”—Mr. Gu Mingyuan Talks with IFlytek Educational Technology Research Institute. *Modern Educational Technology*, 34(08): 5–12.
- [11] Liu X, 2024, Reform and Response: A Four-Dimensional Approach to Artificial Intelligence Education Legislation. *Journal of Comparative Education*, (04): 34–51.
- [12] Sun L, 2024, Preschool Teachers’ Evaluation Literacy in Digital Perspective: Development Judgment and Optimization Direction. *Education Science*, 40(03): 90–96.
- [13] Sun Y, 2024, Design of SLAM Companion Robot System Based on Laser Fusion and Color Vision. *Automation & Instrumentation*, (02): 204–208.
- [14] Sun L, Wang Y, 2023, The Value, Hidden Worries and Resolution of the Meta-Universe of Pre-School Education under Digital Transformation. *Education Review*, (12): 16–23.
- [15] Li Y, Li C, 2023, Application of Improved Bidirectional Sequential Neural Network in Preschool Chatbot. *Automation & Instrumentation*, (10): 205–208 + 213.
- [16] Luo X, 2023, How to Carry Out Artificial Intelligence Education in Kindergartens in China—Based on the Inspiration of the American Guide to Artificial Intelligence for Children Aged 5–6. *Journal of Shaanxi Pre-School Teachers College*, 39(09): 43–50.
- [17] Xiao X, Feng S, 2023, Research on the Construction of High-Quality Preschool Education Teacher Team in the New Era of Artificial Intelligence Empowering. *Journal of Sichuan Light Chemical Engineering University (Social Science Edition)*, 38(04): 89–100.
- [18] Wang J, Liu T, 2023, Research on Artificial Intelligence Education Strategy in Singapore from the Perspective of Triple Helix Theory. *Journal of Comparative Education*, (03): 111–122.
- [19] Li J, Pan H, 2023, Application and Challenge of Image Generation Technology in Preschool Education. *Science and Technology Wind*, (15): 64–66.
- [20] Wei C, 2023, Thinking on Artificial Intelligence Education Activities in Kindergartens under the Background of Artificial Intelligence Era. *China Modern Educational Equipment*, (10): 64–66 + 70.

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Practical Research on Ideological and Political Education in Public Basic Courses of Colleges and Universities from the Perspective of “Integrated Ideological and Political Education”

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Abstract: Research on ideological and political education in public basic courses of colleges and universities has been recognized as a crucial means of enhancing the quality of higher education and promoting the comprehensive development of students. By constructing an implementation framework for ideological and political education based on the “integrated core and three wings” model, this study explores the multi-classroom integration approach under the “characteristic wing,” in which ideological and political education is embedded into public basic courses. The objective is to improve students’ ideological and political qualities, fostering their development as socialist builders and successors with well-rounded growth in morality, intelligence, physique, aesthetics, and labor. The practical foundation of the research is first analyzed, followed by an elaboration on the implementation method of the “integrated core and three wings” approach in ideological and political education within public basic courses. Reflections on the implementation process of multi-classroom ideological and political education are provided, along with suggestions for improvement.

Keywords: Public basic courses; Ideological and political education in courses; College sports; Integrated core and three wings; Holistic education

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1. Introduction

It has been emphasized by Minister of Education Jinpeng Huai that the establishment of a comprehensive ideological and political education (IPE) system in physical education (PE) should be accelerated by leveraging the vast social classroom, developing online cloud classrooms, and deepening IPE integration across all courses. It is widely acknowledged that classroom instruction serves as the primary channel for PE activities in colleges and universities; however, it does not constitute the entirety of PE. Extracurricular PE activities, including sports

clubs, athletic training, and competitions, are also rich in IPE resources^[1]. “Fully integrating IPE across all courses” has been aligned with the requirement for holistic education. A strong focus should be maintained on the primary classroom as the main channel, ensuring the full utilization of the educational function of courses. Concurrently, the second classroom should be strengthened as the main front, maximizing the educational function of practice, while the third classroom should be effectively utilized as the main platform, leveraging the educational capabilities of the internet. According to literature reviews, research on maximizing the IPE effect both inside and outside the PE classroom has not been explored in sufficient depth. This study is focused on PE, primarily examining resource development and practical pathways for IPE in the second and third classrooms. The goal is to achieve a synergistic integration of multiple classroom modes for IPE in PE, ensuring the alignment of IPE both inside and outside the PE classroom, the unification of explicit and implicit education, and the creation of a synergistic effect. Furthermore, efforts are directed toward establishing a comprehensive education system that encompasses all members, processes, and aspects, thereby ensuring that IPE is “embedded” in PE throughout the entire learning process for both teachers and students.

2. Practical research foundation

Since the issuance of the *Guiding Outline for the Construction of Ideological and Political Education in College Courses* by the Ministry of Education in May 2020, the construction of IPE in colleges and universities has been widely emphasized and implemented. Research on IPE has entered a phase of extensive development. At the macro level, the development framework of IPE has been clarified, as seen in studies on “hot topics, focused issues, and future trends in IPE research in PE courses.” At the micro level, the methodology and practical theories of IPE in PE have been further refined, including the identification and application of IPE elements in PE courses, the enhancement of PE teachers’ IPE-related competencies, and the establishment of collaborative regions for the development and sharing of IPE resources in PE. These approaches have contributed to improving the implementation of IPE in PE. While research and practice on IPE within PE classrooms have been firmly established and continuously developed, studies on IPE outside PE classrooms remain insufficient.

Currently, the Party Branch of the Teaching Department of Basic Courses at Jingjiang College consists of 35 teachers, among whom 22 are Party members. This includes 11 English teachers, five higher mathematics teachers, two ideological and political theory teachers, and four PE teachers who are Party members. These four foundational disciplines encompass all public foundation courses at the college and are mandatory for all first- and second-year students, providing the necessary material conditions for this study.

3. Implementation of IPE in public basic courses through the “integrated core and three wings” approach

3.1. Integrated core: A “large teaching (and research)” community centered on Party building

3.1.1. Party building leadership for the deepening of theoretical education

Adhering to Party building leadership, basic Party organization activities, faculty and staff political theory learning, “Three Meetings and One Class” (Party committee meetings, Party branch meetings, group meetings for Party members, and Party lessons), democratic life meetings, and Party group meetings have been utilized as activity links for the “large teaching (and research)” community, encompassing English, ideological and political courses, higher mathematics, and physical education. By leveraging the disciplinary advantages of

Marxism, the theoretical, ideological, and knowledge-based nature of other courses has been strengthened. Special lectures, seminars, and other activities have been conducted to facilitate the deep integration of Marxist theory with other courses.

3.1.2. Pairing assistance for mutual improvement

To ensure depth, breadth, and warmth in course development and implementation, ideological and political course teachers have been assigned to collaborate with instructors in the other three disciplines. Through this pairing assistance, educational resources have been explored, teaching content has been developed, and teaching methods have been discussed. Challenges such as reluctance, lack of ability, or insufficient skills in delivering IPE have been addressed, embedding the concept of IPE into teachers' educational philosophy.

3.1.3. Research as a driver of innovation

Simultaneously, continuous efforts have been made to enhance research capabilities related to IPE. The frontiers and emerging topics of IPE research across disciplines have been integrated to promote mutual learning. As emphasized by President Xi Jinping at the National Conference on Ideological and Political Work in Colleges and Universities in 2016, "Ideological and political work should permeate the entire process of education and teaching. All other courses should guard their own section of the canal and cultivate their own responsibility fields, ensuring that all courses move in the same direction as ideological and political theory courses and create a synergistic effect"^[2].

Currently, a working mechanism has been widely established in colleges and universities, wherein the university's Party secretary and president maintain contact with grassroots units to deliver ideological and political lessons for students. This approach embodies the integration of Party building and IPE, facilitates university leaders' understanding of frontline IPE teaching and student needs, maximizes the role of university leadership in promoting IPE, and fosters a positive demonstration effect.

3.2. Wing of role models: Establishing role models for mutual progress

3.2.1. Leading teachers to build teams

Through further study and training, a group of renowned teachers for IPE is cultivated to demonstrate their leadership in IPE teaching. IPE teaching teams are formed, collaboration and communication within the teams are strengthened, and the quality of IPE teaching is collectively enhanced. Further study and training for teachers of public basic courses are actively promoted, enabling the cultivation of influential and approachable renowned teachers and teams for IPE. A specific discipline is used as a demonstration to develop a "golden course" for that field.

3.2.2. Interdisciplinary collaboration for school-based textbook compilation

Through interdisciplinary collaboration, the characteristics and educational goals of each course are integrated to compile school-based textbooks incorporating IPE elements. The integration of IPE into PE courses is promoted to achieve an organic combination of PE and IPE.

Joint research projects are applied for, lesson preparation is conducted collectively, and classes are attended together to break down disciplinary boundaries. Communication platforms are established to facilitate collaboration on teaching and research activities, enabling the identification of convergence points between IPE and various disciplines. Simultaneously, the IPE orientation of teaching content, design, and objectives is reinforced, standardized IPE models are developed, exemplary cases are established, and the professional

development of teachers within the “large teaching (and research)” community is advanced.

3.2.3. Standardizing IPE models and establishing examples

The power of role models is significant, and their forms can be diverse. Zhao ^[3] proposed various forms, including regional collaboration, synergy, complementarity, innovation, and mutual learning, to create a collaborative team for the construction of IPE resources in college PE courses. Ultimately, a national collaborative mechanism for IPE resource development in PE courses is established, reinforcing the critical role of PE courses in inspiring and shaping students’ ideological qualities and behavioral norms. This entails the establishment of exemplary IPE courses at the school, regional, and national levels, thereby fostering mutual progress through shared learning ^[3].

3.3. Wing of safeguards: Comprehensive planning and strong support

3.3.1. Party committee leadership with multi-department collaboration

IPE is recognized as a systematic initiative. To establish a strong awareness of comprehensive IPE across the university, the construction process must be led by the Party committee, with resources pooled from the university, departments, faculty, and other stakeholders. Efforts should be coordinated through multiple channels, and the establishment of an IPE construction committee should be promoted to create a collaborative and interconnected educational framework of “joint discussion, joint management, and joint construction” among various departments. This approach ensures the effective implementation of IPE. For instance, at Beijing Sport University, a leading group and an expert advisory committee for IPE have been established, forming a work pattern in which the Party committee provides unified leadership, the academic affairs office coordinates overall efforts, relevant departments collaborate, and colleges oversee implementation. A three-tiered working mechanism has been developed, linking the university’s Party committee, college Party organizations, and teacher Party branches ^[4].

3.3.2. Leveraging the role of teacher party branches as battle forts

Teacher Party branches in colleges and universities serve as fundamental units for educating, managing, supervising, and supporting Party-member faculty. They function as strongholds for implementing the Party’s guidelines and policies throughout the entire teaching and management process in higher education institutions. In line with the directive that all Party work should be brought to the branch level, the primary role of these branches is to ensure that the emphasis on political awareness permeates education, teaching, and research ^[5]. The leading and exemplary roles of Party-member teachers in IPE construction must be effectively utilized. During Party activities for student members, teacher Party branches should encourage and facilitate the participation of professional faculty, integrating IPE elements into these activities. By combining student Party branch activities with the reinforcement of professional knowledge, these initiatives serve as an effective extension of IPE classroom teaching, achieving an organic integration of Party building and talent cultivation.

Currently, the teaching staff of the Teaching Department of Basic Courses’ Party Branch consists of instructors specializing in four public basic courses: English, higher mathematics, ideological and political theory, and physical education. These courses are delivered to first- and second-year students, who are at a “critical period” in forming their worldviews, outlooks on life, and values. This research project aims to inject new momentum into moral education, fostering students to become socialist builders and successors while contributing innovative perspectives to theoretical research.

3.4. Three classrooms

3.4.1. First classroom: Teaching activities

Ideological and political elements are incorporated into physical education curricula to foster students' spirit of unity, cooperation, and resilience through teaching activities. The characteristics of sports events are integrated, and competitions with ideological and political significance are conducted to enhance students' overall development. The primary role of the first classroom is upheld by physical education teachers, ensuring that the educational function of the curriculum is fully utilized while imparting skills ^[6].

3.4.2. Second classroom: Extracurricular learning and practical activities

Considering that some students enjoy sports but are less inclined toward physical education classes, sports clubs serve as essential platforms for engagement. The primary position of the second classroom is actively maintained by physical education teachers, allowing the ideological and political education function to be fully realized. Simultaneously, group activities such as school sports events and various individual competitions are leveraged to reinforce the leading role of sports competitions in students' ideological and political education.

3.4.3. Third classroom: Influence of online new media and other classrooms

Online new media platforms are utilized to implement ideological and political education within the curriculum, disseminating sportsmanship and related ideological concepts through WeChat public accounts, short videos, and other digital means. Students are encouraged to participate in sports-related ideological and political activities via online platforms, forming a comprehensive education model that integrates both offline and online learning. Furthermore, during major Chinese team competitions, the third classroom is fully utilized to enhance the educational potential of the Internet. The integration of extracurricular sports activities, sports clubs, and sports associations is promoted to develop a holistic approach to ideological and political education, ensuring its presence across all students, aspects, and stages of learning. Patriotism and national pride are instilled through the performances of outstanding athletes and the in-depth presentation of significant sports events. Confidence in traditional Chinese culture is reinforced, and the belief in the excellence of Chinese culture is firmly propagated through campus sports culture, including material culture and events such as Campus Sports Culture Month.

During the teaching process, it has also been observed that courses such as College English and Advanced Mathematics are actively exploring multi-classroom models for ideological and political education. The ideological and political education of public basic courses is being developed through the integration of Party-building efforts, representing an ongoing exploration and innovation in school curricula. During the implementation phase, continuous reflection, learning, and improvement are required from all practitioners, with full dedication to cultivating socialist builders and successors.

4. Reflections on the implementation process of multi-classroom ideological and political education in curricula

In this research, the “point-to-area” approach was adopted, with “sports” serving as a model to drive other disciplines. Consequently, the integration of multi-classroom ideological and political education into physical education curricula has been emphasized as both a key feature and a foundational element of the study. To align with the practical orientation of the multi-classroom collaboration mechanism for ideological and political

education in public basic courses, greater efforts should be directed toward constructing a collaborative framework specifically for ideological and political education in physical education curricula within colleges and universities.

4.1. Establishing a multi-classroom collaboration and construction team for ideological and political education in college curricula

Although each discipline can be effectively delivered through regular teaching, sustained efforts are required to consolidate these elements into a cohesive team. The collaborative construction team for ideological and political education resources in college physical education curricula should be systematically structured based on the inherent logical organization of ideological and political elements within the discipline of physical education. This team should comprise sports experts, ideological and political education specialists, frontline physical education instructors, sports researchers, student affairs personnel, and information technology professionals.

By integrating various sports themes within physical education curricula, this team should focus on the collection, organization, synthesis, and instructional adaptation of ideological and political education resources. These efforts should be implemented across practical teaching, sports clubs, athletic competitions, and online platforms dedicated to ideological and political education in sports. Such initiatives are essential to addressing the practical requirements for establishing a multi-classroom collaboration mechanism for ideological and political education in college physical education curricula.

Within the broader framework of “Great Ideological and Political Education,” the strengthening of interdisciplinary collaboration between physical education instructors and faculty members from other public basic courses must also be prioritized to foster a comprehensive “Great Teaching and Research” initiative. More importantly, the primary teaching objective should be clearly defined as the enhancement of ideological and political education effectiveness within curricula. Furthermore, demonstration and leadership should be reinforced by establishing exemplary classrooms, deepening curriculum reform and innovation, forming a “demonstration-oriented” leadership team, and elevating the overall quality of teaching.

4.2. Formulating an evaluation mechanism for multi-classroom collaboration in ideological and political education in college curricula

The effectiveness of ideological and political education in curricula is of paramount importance, yet its objective evaluation remains a significant research challenge and area of focus. The successful implementation of a multi-classroom collaboration mechanism for ideological and political education in college physical education curricula depends on a well-structured evaluation system. Accordingly, the evaluation mechanism can be categorized into two types.

First, the evaluation of teachers is conducted, emphasizing their professional ethics, teaching styles, physical education instruction, club counseling, and sports training, with peer and student evaluations serving as key references^[7]. Second, the evaluation of students is undertaken to assess their progress in physical health, sports literacy, well-rounded personality development, and sportsmanship. A diversified approach is adopted to ensure the effectiveness of ideological and political education in physical education curricula. This includes a multidimensional evaluation framework that considers student participation, teamwork abilities, perseverance, individual differences, and overall progress.

Furthermore, a combination of qualitative and quantitative evaluation methods is employed. Qualitative

aspects, such as students' classroom engagement and practical performance, are integrated with quantitative measures, including academic grades and competition results, to enhance the evaluation system for online ideological and political education. To incorporate student feedback and learning outcomes effectively, a comprehensive evaluation approach is required. This involves not only assessing students' academic performance throughout their studies but also utilizing big data technology to conduct precise and well-founded qualitative assessments of learning outcomes and feedback. Specifically, learning attitudes and academic achievements in the first classroom, practical effectiveness and social influence in the second classroom, and autonomous learning along with real-world performance in the third classroom are analyzed comprehensively. Through this approach, an all-encompassing evaluation system covering all classroom settings is established ^[8].

4.3. Stimulating internal and external motivation for collaborative construction of multi-classroom ideological and political education in college curricula

Internal motivation is regarded as the primary driving force. Colleges and universities should ensure that the IPE in curricula aligns closely with the context of the times and talent cultivation programs. Theoretical learning on IPE construction should be strengthened among all physical education teachers to continuously enhance students' sports skills and educational outcomes. Physical education teachers should be made aware of the importance of safeguarding their own "responsibility fields," while being encouraged to engage in continuous learning, refine their professional skills, and improve their capabilities in ideological and political education. This process aims to reinforce the professional confidence of physical education teachers in IPE construction. Naturally, internal motivation involves both the enhancement of ideological awareness and the improvement of teaching and research capabilities in IPE curricula. For instance, the application of embodied theory demonstrates the significant value of integrating embodied cognitive theory into ideological and political education within physical education curricula. By incorporating physical participation, situational teaching, the unity of cognition and emotion, and the integration of rule awareness with moral education, the organic fusion of physical education curricula and IPE can be effectively realized, thereby promoting students' holistic development ^[9].

External motivation is reflected in the continuous reinforcement of human and material support by the government for the multi-classroom collaboration model in colleges and universities. Physical education teachers should be actively encouraged to "go out" to engage in ongoing learning, identify gaps, and "bring in" innovative methods. Policy guidance for IPE in curricula should be strengthened, with efforts made to establish regionally demonstrative models. The construction of IPE in physical education curricula serves as a crucial pathway for advancing the connotative development of higher education and represents a contemporary initiative to cultivate socialist builders and successors who embody both moral and physical excellence, achieving comprehensive development ^[10].

5. Conclusion

This study explores the effective integration of ideological and political education into public basic courses in colleges and universities, using the innovative multi-classroom model in college physical education as an example. The objective is to establish a model that serves as a reference point for enhancing IPE in other courses, forming an innovative framework of "integrated core with three wings." This approach is centered on a "Large Teaching (and Research)" community built around Party-building principles, with an emphasis on setting examples and progressing collectively. Through systematic planning and strong institutional support, the integration of multiple classrooms and comprehensive education is promoted, ultimately establishing a holistic,

full-process, and all-encompassing educational framework.

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References

- [1] Ministry of Education, 2022, Notice of the Ministry of Education and Nine Other Departments on Printing and Distributing the “Work Plan for Comprehensively Advancing the Construction of the ‘Great Ideological and Political Course,’” viewed November 13, 2021, http://www.moe.gov.cn/srcsite/A13/moe_772/202208/t20220818_653672.html
- [2] Xi J, 2016, Emphasized at the National Conference on Ideological and Political Work in Colleges and Universities: Penetrating Ideological and Political Work Throughout the Entire Process of Education and Teaching, and Creating a New Situation in the Development of China’s Higher Education, viewed November 13, 2021, <http://dangjian.people.com.cn/n1/2016/1209/c117092-28936962.html>
- [3] Zhao F, 2022, Research on the Regional Collaboration Mechanism for the Co-construction and Sharing of Ideological and Political Resources in College Physical Education Courses. *Journal of Beijing Sport University*, 45(6): 1–11.
- [4] Zhao F, Huang L, Lv K, 2022, Hotspots, Focuses, and Future Trends of Ideological and Political Research in Physical Education Courses. *Journal of Wuhan Sport University*, 56(5): 22–28.
- [5] Fu Y, 2022, Functions, Goals, and Paths of Promoting Ideological and Political Education in Courses through College Party Building. *Modern Education Management*, 7: 122–128.
- [6] Ministry of Education, 2020, Notice of the Ministry of Education on Printing and Distributing the “Guiding Outline for the Construction of Ideological and Political Education in Courses at Colleges and Universities,” viewed November 13, 2021, http://www.moe.gov.cn/srcsite/A08/s7056/202006/t20200603_462437.html
- [7] Lv K, Xing F, 2022, The Characteristics, Dilemmas, and Optimization Paths of Ideological and Political Education in Courses at Sports Colleges and Universities in China. *Journal of Shenyang Sport University*, 41(6): 35–42.
- [8] Zhang L, Ding D, 2022, Research on Deepening the Whole-Classroom Education Model of Ideological and Political Education in Courses. *School Party Building and Ideological Education*, 22: 51–53.
- [9] Wang J, 2022, Research on the Educational Mechanism of College Etiquette Culture Based on Embodied Cognition Theory. *Journal of Nanjing University of Science and Technology (Social Science Edition)*, 35(4): 78–82.
- [10] Zhao F, Jiao J, Zhao P, 2021, Research on the Theoretical Essence and Practice Dimensions of Ideological and Political Education in Physical Education Courses from the Perspective of “Cultivating Talent through Virtue.” *Journal of Beijing Sport University*, 44(3): 72–81.

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An Action Research on Music Appreciation Activities in Kindergarten Classes Based on Situational Teaching Approach

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Abstract: As a crucial vehicle for young children's artistic enlightenment, music appreciation holds an irreplaceable value in cognitive development, emotional edification, and the cultivation of aesthetic abilities. Currently, in music appreciation activities for senior kindergarten classes, there is a widespread phenomenon of homogenized teaching content and mechanized teaching methods, which results in insufficient enthusiasm for participation among young children and a superficial understanding of music. The situational teaching method, by constructing concrete and immersive learning scenarios, can effectively activate young children's multi-dimensional sensory experiences. Its characteristics of intuitiveness and interactivity are highly consistent with the traits of young children's concrete thinking, thus providing a new approach to resolving the current predicament. The research focuses on the practical pain points in music appreciation activities for senior kindergarten classes and proposes targeted solutions from four dimensions: content design, method innovation, resource integration, and teacher training, aiming to reconstruct a child-centered, in-depth music learning model. Practice has shown that the situational teaching method can not only enhance young children's perceptual sensitivity to musical elements but also guide them to achieve emotional resonance through role-playing and life-related associations, laying a foundation for the sustainable development of young children's musical literacy.

Keywords: Contextual pedagogy; Kindergarten class; Music appreciation activities; Problems and measures

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1. Introduction

The senior class in kindergarten represents a pivotal phase for the development of children's musical capabilities. As a crucial practical form of aesthetic education, music appreciation activities need to transcend the limitations of the unidirectional indoctrination in traditional teaching. Currently, prevalent issues in music appreciation activities include the confinement of teaching content to classic pieces, the over-reliance on audio playback as a teaching method, and the lag in the renewal of teaching resources. These problems impede the full

release of children's emotional experiences of music and artistic imagination. The situational teaching method emphasizes promoting the internalization of knowledge through scene construction and emotional connection, and its core concept is highly compatible with the learning pattern of "learning through play" for young children^[1]. For instance, integrating the music piece *Carnival of the Animals* with a forest adventure story scenario enables children to intuitively perceive the rhythm changes and emotional expressions of the melody during role-playing. Nevertheless, problems such as the insufficient depth of situational creation and the teachers' weak ability to interpret musical works restrict the practical effectiveness of this teaching method. Exploring the integration path of the situational teaching method and music appreciation activities not only requires optimizing the diversity of teaching resources but also calls for attention to the teachers' ability in narrative design and dynamic guidance of musical situations, so as to truly achieve the educational goal of "inspiring emotions through situations and promoting learning through emotions."

2. Overview of situational teaching method and music appreciation activity of kindergarten classes

2.1. Concept and characteristics of the contextual teaching method

As a crucial methodology in the realm of modern education, the essence of the situational teaching method lies in facilitating learners' internalization of knowledge and emotional resonance through multi-dimensional scenario construction. Within the scope of preschool education, this teaching method emphasizes transforming abstract concepts into concrete experiences. By means of role-playing, story-telling, or re-creating real-life scenarios, it helps young children form embodied cognition in an immersive environment. Different from the traditional one-way teaching mode, its prominent characteristic is reflected in the dynamic generativity of situational design. Teachers, based on the emotional tone and narrative structure of musical works, flexibly create a composite field that includes visual, auditory, and kinesthetic elements, enabling young children to decipher and reconstruct musical symbols unconsciously. Especially in music appreciation activities, this teaching method can effectively bridge the gap between young children's concrete thinking and the abstract nature of music. For example, simulating the scene of continuous spring rain during the appreciation of "The Voices of Spring Waltz" guides young children to establish a metaphorical connection between natural phenomena and musical vocabulary. Contemporary research confirms that high-quality situational design should follow the principle of synergy between the characteristics of the musical ontology and the cognitive laws of young children. It not only maintains the integrity of musical art but also meets the development needs of the symbolic thinking of children in the senior class of kindergarten. This dual adaptability constitutes the irreplaceable application value of the situational teaching method in music education.

2.2. Objectives and contents of music appreciation activities in kindergarten classes

The core objective of music appreciation activities in the senior class of kindergarten lies in cultivating young children's aesthetic perception and emotional connection abilities towards musical art, laying a foundation for their lifelong artistic accomplishment. Activities at this stage should guide children to go beyond mere auditory experiences and gradually establish a dynamic correlation between musical elements, life experiences, and emotional expressions. For instance, when appreciating "Flight of the Bumblebee," they can perceive the metaphorical relationship between pitch variations and the movement characteristics of living organisms. Content selection should take into account both classicism and age-appropriateness, encompassing classical music excerpts, ethnic nursery rhymes, and modern children's music works. Emphasis should be placed on

the diversity of musical genres to expand aesthetic horizons. In practice, life-related content such as festival-themed music and symphonies of natural sound effects can be incorporated. Children can experience the essence of traditional culture in the lively melody of “Spring Festival Overture,” or be inspired with a sense of environmental concern through the ecological soundscape of “Rhapsody in the Forest.” It is worth noting that the cultural attributes of musical materials need to be balanced with children’s cognitive levels. When selecting music pieces with distinct regional characteristics like “Jasmine Flower,” visual folk elements should be supplemented to assist children in understanding the cultural narratives behind the music. Contemporary educational concepts emphasize integrating music appreciation with interdisciplinary experiences. For example, by combining picture-book illustrations to analyze the phrase structure of “Carnival of the Animals,” abstract melodies can be transformed into tangible symbolic images. Such designs can not only deepen children’s understanding of music but also activate their potential for creative thinking ^[2].

3. Problems of music appreciation activities in kindergarten classes

3.1. Teaching content

There are prominent structural contradictions in the instructional content design of current music appreciation activities for kindergarten seniors. This is primarily manifested as an imbalance between the standardized tendency in music material selection and the individualized aesthetic needs of young children. In most teaching practices, the phenomenon of a rigid repertoire is highly evident. An over-reliance on the recommended tracks in textbooks results in a limited coverage of music styles. Diverse genres such as ethnic music and modern electronic music have long been marginalized. This homogenized content supply not only restricts the expansion of young children’s musical horizons but also tends to lead to a flat development of their aesthetic perception. The issue of the estrangement between the teaching content and young children’s life experiences also merits attention. Some musical pieces, due to their adult-oriented cultural backgrounds or emotional expressions, struggle to trigger emotional resonance and experience transfer among young children. In teaching practices, there is a general lack of precise understanding of the stages of young children’s cognitive development. A hierarchical content system has not been designed in line with the characteristics of the budding symbolic thinking stage of kindergarten seniors, leading to a gap between the analysis of musical elements and young children’s comprehension abilities. From a cultural perspective, the development of local music resources is insufficient. The integration of regional characteristic music with universal aesthetic education has not been effectively achieved, thus weakening the cultural inheritance function of music appreciation activities. These limitations in the content directly result in the lack of young children’s subjectivity in music experiences, and their learning motivation shows a passive trend. It is urgent to make a breakthrough through systematic reconstruction ^[3].

3.2. Teaching methods

The teaching methods employed in music appreciation activities for senior kindergarten classes generally exhibit a tendency towards mechanization and superficiality, making it difficult to stimulate young children’s profound aesthetic experiences. Most teachers still adhere to the one-way indoctrination model, dissecting musical elements into isolated knowledge points such as rhythm and melody, for explanation while neglecting the cognitive laws of children’s embodied perception and emotional transfer. There is a lack of dynamic generation in the teaching process. The teaching paths pre-set by teachers often become rigid, failing to adjust interactive strategies according to the immediate feedback from children, which results in their understanding

of music remaining at the level of symbolic memory. The application of multimedia technology mostly stays at the function of audio playback, lacking instructional designs that integrate multimodal sensory interactions. For example, no effective connection is established between physical movements, color vision, and musical emotions. Teachers have a misinterpretation of situation creation. Some of the designed situations deviate from the inherent characteristics of music, evolving into mere role-playing games, thus weakening the core value of music appreciation. The teaching evaluation system emphasizes summative assessment, neglecting the observation and recording of process-oriented indicators such as children's musical association ability and emotional resonance. This mechanized approach not only suppresses children's creative expression but may also lead to a stereotyped development of their aesthetic perception. It is urgent to innovate teaching methods to construct a more inclusive and generative musical dialogue field.

3.3. Teaching resources

The allocation of teaching resources for music appreciation activities in senior kindergarten classes shows a tendency towards homogenization and structural imbalance, which restricts the healthy cycle of the music education ecosystem. The existing resource system overly relies on the supporting materials of standardized teaching materials. The update of auxiliary materials such as musical instrument atlases and sound effect libraries lags behind the development trend of music culture, resulting in the feature of low-level repetitive construction in the teaching material library. The application of digital resources mostly stays at the shallow-level functions such as audio playback and animation display, failing to construct an immersive music experience space with synchronized sound and picture and multimodal linkage. There are significant gaps in the development of regional characteristic music resources. Cultural genes such as local folk music and dialect nursery rhymes have not been effectively transformed into operable teaching resource packages. Teachers generally have weak abilities to integrate interdisciplinary resources and find it difficult to creatively transform environmental elements such as natural sounds and daily life sound effects into cognitive scaffolds for music appreciation. The urban-rural disparity in resource allocation further exacerbates the differentiation of teaching effects. Some kindergartens are limited by hardware conditions, with a single variety of music teaching aids and insufficient interactivity, making it difficult to support the generation of multi-dimensional sensory experiences. The limitations of this resource ecosystem not only weaken the extensibility of music appreciation activities but also impede the in-depth development of children in terms of cultural perception and aesthetic creation.

3.4. Teachers' professionalism

The compound deficiency in the musical professional qualities of kindergarten teachers has become a crucial bottleneck restricting the improvement of the quality of music appreciation activities for senior kindergarten classes. Some teachers have structural flaws in their ability to analyze the essence of music, finding it difficult to precisely grasp the emotional expression characteristics and artistic performance laws of different musical genres, which causes the activity design to fall into a standardized replication mode. The prominent issue of the lag in the renewal of educational concepts persists, with the cognitive bias that equates music appreciation with knowledge imparting, neglecting the generative nature and individual differences of children's aesthetic experiences. The weakness in interdisciplinary integration ability is remarkable. Most teachers have not yet developed the curriculum design thinking of organically integrating art forms such as literature and drama into musical contexts. The lack of continuous specialized support for music education in the post-service training system makes it difficult for teachers to keep up with the forefront development of contemporary music

education theories. The general lack of teachers' improvisational creation ability directly affects the vividness of situation creation, and the mechanical execution of procedures weakens the meaningful connection between music and children's lives. The insufficient depth of understanding of diverse musical cultures during the professional development process restricts both the development of local music resources and the expansion of an international musical vision. This imbalance in the quality structure not only affects the realization of the educational value of music activities but may also lead to the one-sided development of children's early aesthetic experiences.

4. Solutions to the problems of music appreciation activities in kindergarten classes based on contextualized teaching methods

4.1. Optimizing teaching content

Under the guidance of the situational teaching method, optimizing the content of music teaching necessitates the construction of a dynamic and diversified material-selection mechanism to break through the limitations of the traditional textbook framework. The selection of music materials should be based on a profound analysis of children's life experiences and cultural backgrounds. Preference should be given to folk music elements with regional and seasonal characteristics, and everyday sound sources such as natural sounds and dialect rhythms should be incorporated into the scope of music perception^[4]. The arrangement of teaching content should follow the spiral-rising law of aesthetic cognition. A hierarchical experience sequence from concrete sounds to abstract melodies should be designed to enable children to gradually understand the emotional coding system of music through situational transfer. A cross-cultural music resource library should be established to systematically integrate the aesthetic characteristics of world-class classical music and local traditional music, thereby cultivating children's multi-cultural understanding ability. Teachers need to enhance their ability to distinguish the educational value of musical works, with a focus on excavating sound combinations that can trigger children's synesthetic experiences, such as the analogous connection between the rhythm of raindrops and the beat of drums. Establishing a dynamic adjustment mechanism is of utmost importance. The composition ratio of the teaching repertoire should be flexibly updated according to children's immediate emotional feedback and participation data. This content reconstruction strategy not only ensures the cultural inheritance function of music appreciation activities but also reserves aesthetic imagination space for the development of children's creative thinking^[5].

4.2. Improving teaching methods

The implementation of the situational teaching method in music appreciation activities necessitates the reconstruction of the dynamic interactive model of teaching methods, breaking the rigid framework of traditional one-way instruction. Teachers should transform into the role of situational designers, creating immersive experience scenarios with temporal and spatial continuity based on the narrative structure and emotional context of musical works. During the teaching process, a two-way feedback mechanism should be established^[6]. The presentation intensity of situational elements should be adjusted in real time through the children's physical expressions and emotional responses, forming an organic connection between music perception and life experiences. The application of the multi-sensory synergy strategy is of crucial value. By intelligently matching auditory stimuli with environmental elements such as tactile materials and lighting changes, synesthetic effects in children can be stimulated. The in-depth integration of digital technology should transcend the instrumental usage level. Interactive music exploration spaces can be constructed with the help of virtual reality technology,

transforming abstract musical elements into visual dynamic images. The pacing of teaching should follow the law of children's attention curve, establishing a flexible conversion mechanism between collective perception and individual exploration. A process-oriented evaluation system should be established to record the evolving trajectory of children's aesthetic reaction patterns in the situation, providing a basis for the iteration of teaching strategies. This transformation of teaching methods not only promotes the embodied development of children's music cognition but also subtly cultivates their artistic synesthetic ability and creative thinking qualities^[6].

4.3. Enriching teaching resources

Under the framework of the situational teaching method, the construction of music teaching resources needs to break through the static storage mode of traditional material libraries and build a dynamically generated cultural ecosystem. Resource development should establish a multi-dimensional screening mechanism, transforming spatio-temporal elements such as regional seasonal changes and folk activity scenes into perceptible music teaching carriers to form a vital cultural gene pool^[7]. The intelligent reorganization of digital resources is of revolutionary significance. By using algorithm-matching technology, emotional correlation mapping is carried out between classic music segments and natural environmental sounds to generate interactive soundscape material packages. The transformation of physical teaching aids should follow the principle of multi-sensory linkage. Intelligent musical instrument devices that can provide feedback on tactile vibrations and visual changes should be designed to enable abstract music concepts to acquire materialized expression forms. For the integration of cross-cultural resources, a gradient penetration model should be established. World music cultural symbols should be integrated in layers according to the cognitive development laws of young children to cultivate cultural inclusion awareness through comparative appreciation. A resource-sharing network between kindergartens and communities should be established, and living cultures such as folk artists' skill demonstrations and sounds from traditional handicraft workshops should be incorporated into the resource update channels. The teacher resource package should be equipped with a situation generation module, providing multi-path scheme templates for the disassembly and recombination of music elements. The construction of this resource ecosystem not only enhances the cultural infiltration function of music appreciation activities but also gives rise to young children's creative musical thinking during the process of resource activation and builds a multimodal support for the transfer of aesthetic experiences^[8].

4.4. Enhancing teachers' professionalism

To enhance teachers' professional competencies, it is necessary to establish a comprehensive competency development system, with a particular emphasis on strengthening their ability to transform and apply the situational teaching method in music education. A dual-track training mechanism should be established to organically combine the renewal of music ontology cognition with integrated training in educational technology, focusing on cultivating teachers' ability to decode musical elements in specific contexts. To reshape teachers' curriculum design capabilities, they need to master the analytical methods of musical narrative structures, accurately identify the emotional trigger points in classic works, and convert them into experiential teaching events^[9]. Mastery of cross-media integration technology has become an essential competency, which requires teachers to possess the ability to creatively design courses by dynamically coupling elements of visual arts, drama performances, etc., with music appreciation. A development file for teachers' musical perception ability should be established, and regular training in soundscape mapping should be carried out to enhance their professional sensitivity to the relationship between musical colors and space. The in-house teaching research

system should incorporate a situation-generation module, and teachers should be organized to participate in music education drama workshops to deepen their understanding of children's aesthetic psychology through role-playing. Upgrading teachers' technological application competencies requires going beyond the mere use of tools. Teachers should master the operating logic of music visualization programming tools and be able to convert abstract musical theories into interactive digital scenarios. Cultivating teachers' ability to transform local cultural resources is of crucial importance. They should be guided to extract musical teaching elements from local folk activities and build a situational material library with cultural roots. The dimensional design of the competency evaluation should be improved. The originality of situation creation and the generativity of teaching interaction should be included in the assessment indicators to promote the transformation of professional development from skill training to the accumulation of educational wisdom^[10].

5. Conclusion

The situational teaching method offers dual insights, both theoretical and practical, for the transformation of music appreciation activities in senior kindergarten classes. Through systematic optimization of teaching content, innovation in situational teaching methods, and the establishment of a diversified resource support system, young children can achieve a leap from passive reception to active construction in music perception during embodied participation. Research has confirmed that music situations restored based on real-life scenarios can awaken children's experiential resonance, while role-playing and story-based situations provide symbolic carriers for their emotional expression. It is worth noting that when creating situations, the tendency towards formalism should be avoided. Teachers should delve deeply into the cultural essence and emotional logic of musical works to prevent the disconnection between the situation and the musical essence. In the future, it is possible to further explore the construction of virtual-real integrated situations empowered by digital technology. For example, augmented reality technology can be used to present visual music scores, or local cultural elements can be incorporated into the situation design to enhance cultural identity. Only by continuously deepening the organic integration of the situational teaching method and music education can we sow the seeds of art that will benefit children throughout their lives.

Disclosure statement

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References

- [1] Ng SC, Bull R, 2018, Facilitating Social Emotional Learning in Kindergarten Classrooms: Situational Factors and Teachers' Strategies. *International Journal of Early Childhood*, 50(3): 335–352.
- [2] Rahmah N, 2019, The Use of Jazz Chant Technique for Teaching Pronunciation at The Second Year Students of SMPN 4 Model Parepare (Classroom Action Research), dissertation, IAIN Parepare, 12–14.
- [3] Williams AMW, 2013, An Action Research Study Using the MUSIC Model of Academic Motivation to Increase Reading Motivation in an Elementary Classroom, dissertation, Virginia Polytechnic Institute and State University, 9–12.
- [4] Lin Z, Devarajoo K, 2021, The Strategies of Teaching Basic Piano Courses for Preschool Education Major in China. *International Journal of Infrastructure Research and Management*, 9(2): 11.

- [5] Bai J, 2022, RETRACTED: Optimized Piano Music Education Model Based on Multimodal Information Fusion for Emotion Recognition in Multimedia Video Networks. *Mobile Information Systems*, 2022(1): 1882739.
- [6] Li Y, 2023, Action Research on Music Appreciation Activities in Large Kindergarten Classes Based on Situational Teaching Method, dissertation, Southwest University.
- [7] Zhao M, 2025, Research on the Teaching Mode in the Field of Experience and Appreciation of Music Lessons in Primary and Secondary Schools, dissertation, Northeastern Normal University.
- [8] Gu X, 2021, Action Research on the Independent Improvement of Teachers' Teaching Literacy in Primary School Music Appreciation Class. *Literary Youth*, (19): 0051.
- [9] Zhang M, 2025, Research on the Application of Local Resources in the Art Teaching Activities of Mixed Classes for Young Children, dissertation, Hunan Normal University.
- [10] Zhang M, 2014, Research on the Application of Local Resources in Mixed Classes——Class M of Class A Kindergarten, Meijiang Town, Xiushan County, Chongqing as an Example, dissertation, Hunan Normal University.

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A Study on Trainee Teachers' Stated Beliefs and Their Pedagogical Practices of Oral Corrective Feedback in the Chinese as a Second Language Classroom

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Abstract: The aim of the present study is to explore how native Chinese trainee teachers reflect on their usages of oral corrective feedback in class and what their actual teaching practices are in Chinese as a second language (CSL) classroom. To this end, a mixed-methods approach was adopted in this study, including the questionnaire to explore teachers' perceptions as well as classroom observation to understand teachers' pedagogical practices during class. Fifteen trainee teachers from the same teacher training program in a university in China were identified and recruited to help complete the current research. The present study indicates that in the CSL context, teachers play an essential role in the language classroom and serve as the main resource of classroom feedback. When comparing trainee teachers' stated beliefs to their teaching practices, some similarities could be identified between them, however, clear divergence was also noticeable in the present study. Compared to the previous studies on oral corrective feedback in ESL and EFL contexts, most of the findings in the current study could correspond to those outcomes. The implication emphasizes the importance of offering more support to trainee teachers to help them deal with the complex classroom context such as through teacher training programs. Further investigations on students' perceptions of oral corrective feedback in class would also contribute to the understanding of oral corrective feedback in the CSL context.

Keywords: Oral corrective feedback; Chinese as a second language; Trainee teacher

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1. Literature review

1.1. Oral corrective feedback in second language acquisition

Corrective feedback (CF) has received considerable attention in recent decades with the pedagogical shift towards "focus on form" in the second-language (L2) educational classroom. According to Ellis ^[1], CF refers to "responses to learner utterances containing an error." Similarly, Yoshida ^[2] defined CF as a form of feedback

that provides indications or correct forms in response to learners' erroneous or inappropriate utterances, in order to elicit their reformulation of such errors. Ellis *et al.* ^[3] also stated that CF in the classroom could be recognized in the form of responses to learners' erroneous language output.

Based on the previous studies, corrective feedback could be further divided into two groups: oral CF and written CF ^[4]. Oral CF, with which the present research is concerned, refers to those instances when CF is delivered through spoken language ^[5]. The present study focuses particularly on the CF provided using spoken language, i.e. oral corrective feedback. The oral corrective feedback in the present study is defined as the spoken feedback initiated by teachers in response to students' oral language errors or inappropriate expressions generated in class.

1.2. Teachers' stated beliefs and practices of oral CF

As discussed by Lyster and Saito ^[6], the amount of research on oral corrective feedback has grown dramatically in the past 20 years. Nevertheless, most of the studies remain focusing on all kinds of CF practices: for example, the categories of CF ^[7,8], the effectiveness of different types and ways of CF ^[6,7,9], students' uptakes of CF and teachers' preferences for CF ^[10], etc. The research into cognitive aspects, or to be more specific, the notions and beliefs about CF as well as how such cognitions are applied in teaching practices, remain relatively unexamined ^[11-13].

However, with the cognitive shift to teachers as independent thinkers, it is argued that teachers' personal beliefs about classroom pedagogical practices might be a crucial issue to shed light on. As indicated by Borg ^[14], teachers actively make decisions about the teaching process based on their personal thoughts and beliefs. Therefore, it would be valuable to uncover teachers' perceptions of oral CF, since it might play an essential role in affecting the oral CF practices in class ^[15], and might further impact the language teaching efficiency.

Instigated by the need to understand how teachers employ oral CF in class, a number of researches have been carried out into their beliefs about it and the reasons behind their corrective practices ^[2,16,17]. Nevertheless, many of these investigations focus on the mismatch between teachers' and students' perceptions on oral CF, or teachers' concerns and researchers' orientations.

Apart from this, even less number of studies have been conducted to bridge teachers' stated beliefs and practices together, the previous investigations also reveal conflicting results. For example, there are several studies indicating that teachers' stated beliefs could correspond to their teaching practices to some extent ^[12,18].

In contrast, study by Basturkmen *et al.* ^[19] showed that there are noticeable discrepancies between teachers' perceptions and practices in terms of oral CF. Similar outcomes are also identified in the research of Roothoof ^[20]. Yoshida's research ^[2] suggested that teachers tended to use a different CF type from what they believed to be more beneficial for learners' progress.

1.3. Types of oral CF

Lyster and Ranta ^[7] observed the incidental CF offered in four French immersion classes (communication-based context) at the primary level in Canada and identified six basic types of CF that occur during the language teaching process, which were then widely adopted as the coding system for a large number of studies from a wide range of contexts ^[20].

1.3.1. Explicit correction

Explicit correction refers to "the explicit provision of the correct form" ^[7] in response to learners' faulty linguistic expression. For example, "Not ...", "You should say...", "Oh, you mean...".

Example 1

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: bu dui, bu shi kan, ni ying gai shuo kan le dian ying. (No, not watch, you should say watched.)

1.3.2. Recast

Recast refers to teachers' "reformulation of all or part of learners' language to remove the error" ^[7], which means the recasting could involve either the whole sentence or just a word. A translation that occurs in response to students' use of other languages (in the present research, English) would also be considered as recast, since it serves similar functions to recasting.

Example 2

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: o, ni zuo tian kan le dian ying, hen hao a. (Oh, you watched a movie last night, so nice.)

1.3.3. Clarification request

As a type of CF, clarification request refers to the need to ask for clarification from a learner. The aim of these requests is to indicate that the utterance generated by a learner is either in a problematic form or misunderstood by the teacher: for example, "Sorry?", "Pardon?", "What do you mean...?" or "Can you say it again?"

Example 3

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: o, ni ke yi zai shuo yi bian ma? (Oh, sorry?)

1.3.4. Metalinguistic feedback

According to Lyster and Ranta ^[7], this type of feedback contains "either comments, information, or questions" in response to a learner's problematic use of language. The comment signals the existence of errors in a learner's language in a relatively general way. The linguistic information and questions refer to the feedback that includes the metalanguage information addressing the nature of the erroneous utterances.

Example 4

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: ni yao yong guo qu shi. (You need a past tense for it.)

1.3.5. Elicitation

Elicitation refers to feedback that aims to elicit the reformulated forms directly from the learners: for example, teachers could provoke students' self-completion of their expressions by deliberately pausing before the problematic part and waiting for the students to fill in the blank. Furthermore, elicitation could be given via the form of questions: for instance, "How to say...in Chinese?"

Example 5

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: ni...? (You...?) (waiting for the student)

1.3.6. Repetition

The repetition feedback refers to teachers' repetition of the learners' faulty language. Normally this type of feedback would be accompanied by a rising intonation at the end of the sentence to highlight that there is an error in it.

Example 6

Student: wo zuo wan kan dian ying. (I watch a movie last night.)

Teacher: wo zuo wan kan dian ying ma? (I watch a movie last night?) (rising intonation)

1.4. Trainee teachers in the Chinese as a second language context

Trainee teachers' perceptions and teaching practices about classroom CF remain an unexplored field. However, it could be argued that their perceptions and practices are worth investigating to some extent, for the following two reasons.

Firstly, compared with experienced teachers, trainee teachers are probably encumbered with more difficulties when offering oral CF. According to Loughran ^[21], novice teachers tend not to have a clear perception of oral CF which they might use during the class, and it is a relative challenge for them to integrate their knowledge and awareness into practice. Secondly, the present study also helps to understand what the trainee teachers are experiencing during their training program, which might contribute to the development of teacher education programs in the future.

Additionally, the present research was conducted in a relatively new context, namely, that of Chinese as a second language (CSL) in a classroom learning context. Researches show that different contexts could trigger diverse characteristics of oral CF. More specifically, Sheen ^[22], in his synthesized research, articulated that the learning context could be a crucial moderator with regard to the provision of CF. In light of this, it is valuable to carry out similar research in a new context (in the present research, Chinese as a second language).

This present study aims to investigate the following questions:

- (1) What are trainee teachers' stated beliefs about their usage of oral corrective feedback in a CSL classroom based on their personal teaching experiences?
- (2) What are trainee teachers' actual pedagogical practices about oral CF in a CSL classroom?
- (3) To what extent do trainee teachers' stated beliefs match their teaching practices?

2. Methodology

2.1. Methods

In order to answer the research questions, mixed methods were adopted in this research, which included a questionnaire that contained both open-ended and close-ended questions (Likert scale and multiple-choice questions). The questionnaire adopted in this research replicated previous research conducted by Farahani and Salajegheh ^[23]. The questionnaire also referenced items from the proposed surveys in the studies of Roothoof ^[13], Roothoof and Breeze ^[24]. The questionnaire mainly focused on six sessions, including trainee teachers' perceptions of the importance and practicality of oral CF, the proper frequency of offering oral CF, the preference of oral CF strategies, the timing of oral CF, the subject to offer oral CF, and which language level would oral CF address.

Meanwhile, the non-participant class observation was also conducted on five of the trainee teachers who also participated in the questionnaire, in order to investigate how oral CF practices were naturally generated during class ^[25]. This research method replicated a previous study carried out by Roothoof ^[20] which addressed similar questions.

2.2. Participants

The 15 participants in this study were recruited from a two-year authorized postgraduate teacher training

program in Tianjin, China, with assistance from the college. These students normally have an average period of 3–9 months of teaching experience. 13 were female and only two were male. Of these, seven of the participants were teachers of basic levels, the remaining eight participants were from the intermediate level.

2.3. Context

Five of the observed classes were listening and speaking lessons, in which relatively sufficient numbers of spoken errors and feedback were observed during the teaching process. The students were all adults from various cultural backgrounds, including the UK, USA, Australia, Dutch, Japan, Korea, Thailand, and Indonesia. Once enrolled in the language courses of the college, these students were assigned to classes according to their language proficiency level, determined by a language placement examination held by the college. The same pedagogical activities and focused linguistic items were shared within same-level classes.

2.4. Data analysis

In terms of the questionnaire, the data analysis process in the research conducted by Farahani and Salajegheh ^[23] acted as an important reference. The closed-end questions were coded and then analyzed using SPSS, and descriptive statistics (mean and standard deviation) were calculated to understand the student teachers' perceptions. The result on the Likert scale was coded from 1 to 5: 1 meaning "strongly disagree" to 5 meaning "strongly agree," with 3 representing neutral. There was one set of questions (six items) that investigated the effectiveness of each type of oral CF. This set of questions was coded from 1 to 4, on a 4-degree Likert scale: 1 indicating "not effective" and 4 being "very effective."

From the five observation tapes, the three having the most sufficient amount of data were selected and further coded and analyzed. The chosen classes consisted of one from the basic level and two from the intermediate level.

Oral CF was categorized into six types: recast, explicit correction, metalinguistic feedback, elicitation, repetition, and clarification request ^[7]. Brown ^[10] argued that this taxonomy is widely adopted including the following researches on CF when coding: Lochtman ^[26], Sheen ^[22], Junqueira and Kim ^[11], Ammar and Spada ^[27], Nassaji ^[28], Vicente-Rasoamalala ^[29], Panova and Lyster ^[8]. The linguistic level in the present study was divided into four types: phonological, lexical, grammatical, and pragmatics, which were adopted from previous research conducted by Mackey *et al.* and Nishita, cited by Yoshida ^[30].

3. Results

3.1. Trainee teachers' stated beliefs on oral CF in the CSL classroom

3.1.1. The perceived importance and practicality of oral CF in class

To begin with, trainee teachers generally showed a positive attitude ($M = 4.067$) towards the usage of oral CF in language teaching classes, and there was little difference between individuals. Then, the participants offered the reasons behind their support for, or concerns about, oral CF.

First of all, it was argued by the trainee teachers that providing CF in class has four advantages in terms of language learning. Eleven teachers mentioned that proper oral CF could help students correct erroneous items and provide students with accurate language. Furthermore, teachers argued that oral CF is timely when dealing with students' errors, leaving a deeper impression on the learners. Another three teachers indicated that by providing oral CF, teachers could further strengthen students' awareness of monitoring their language output. Finally, two teachers also mentioned that their motivation for providing oral CF came from students'

expectations to some extent.

Nevertheless, three of the participants were also concerned about two limitations of oral CF in fostering language learning in a classroom context. One concern was that due to the limited time for providing oral CF, the feedback items could be relatively less organized and systematic. The other is that if the linguistic errors were only addressed using spoken language, students tended to have difficulty remembering and internalizing the feedback.

3.1.2. The frequency of oral CF

Most of the participants argued that they would only provide feedback to half of the errors emerging in class (50%). They gave four main reasons for their statement. Firstly, teachers suggested that time constraints were a crucial factor to consider. Furthermore, they also mentioned that when taking the communication-based class aim into consideration, teachers were advised to give priority to the communicative function of the class activity. Apart from these concerns, six teachers also mentioned that it was better to understand the features of problematic items before giving feedback: for example, if it was only a mistake or an error, or if it was a common problem or an individual's confusion, or if it was significant enough to interfere with the understanding of the meaning or not. Finally, 10 of the trainee teachers also commented on learners' affective issues. It was argued that learners would be less motivated and confident if they were corrected too often.

3.1.3. The timing and subject to offer oral CF

This study investigates the preferred timing of oral CF among trainee teachers. The data reveals that the most preferred timing for oral CF was right after students finished speaking ($M = 4.067$, $SD = 0.799$). Based on the questionnaire, it could be argued that the trainee teachers were more likely to offer timely oral CF right after the occurrence of language errors.

In terms of the need to give the oral CF, the trainee teachers especially supported the teachers in giving oral CF, and all of the 13 participants embraced a positive view on this statement ($M = 4$, $SD = 0$), which signals that they fully supported the essential value of the teachers in the language teaching classroom.

3.1.4. The effectiveness of different kinds of oral CF

The trainee teachers embraced fairly neutral perspectives towards the proposed methods above, without showing explicit preferences or objections. According to the trainee teachers, the most effective type was elicitation ($M = 2.733$, $SD = 0.704$); followed by repetition ($M = 2.667$, $SD = 0.976$); recast ($M = 2.6$, $SD = 0.737$); explicit correction ($M = 2.333$, $SD = 0.816$); clarification request ($M = 2.133$, $SD = 0.743$); and metalinguistic feedback ($M = 2.133$, $SD = 0.99$) (from most effective to least effective). Furthermore, apart from the proposed ways of oral CF, four of the participants also stated that they would use another three methods to give CF in class, namely, peer correction, body language, and the combination of oral and written CF.

3.1.5. Linguistic level that teachers believed was addressed with oral CF

According to the trainee teachers, phonological errors were the most frequently addressed errors during their lessons, which was around 69% of the existing errors. The second most addressed type was grammatical items (59.4%), followed by lexical errors (51.1%), and the least targeted type was pragmatic ones (46.7%).

3.2. Actual pedagogical practices of oral corrective feedback in the CSL classroom

3.2.1. The frequency and types of oral CF in CSL context

Table 1 shows that although there were slight differences between individuals, the rate of corrected errors was relatively high at 78.6% on average. Among all the CFs, recast turns out to be the most frequently used type within the context of language teaching classrooms (45.4%). This was followed by elicitation (18.8%), explicit correction (10.3%), others (8.5%), repetition (6.7%), metalinguistic feedback (6.7%), and finally the clarification request (3.6%).

Table 1. The actual frequency and types of oral CF in class

	Wan	Li	Yu	Total
Number of errors	61	70	79	210
Number of feedback moves	50	52	63	165
% of errors corrected	82.0%	74.3%	79.7%	78.6%
Recast	20	19	36	75 (45.4%)
Clarification request	0	4	2	6 (3.6%)
Metalinguistic feedback	6	2	3	11 (6.7%)
Elicitation	14	11	6	31 (18.8%)
Repetition	3	6	2	11 (6.7%)
Explicit correction	3	7	7	17 (10.3%)
Others	4	3	7	14 (8.5%)

Meanwhile, three other ways of offering feedback were also identified in teaching practice, which are peer correction, re-asking the question, and physical hints. These three ways are concluded and presented in the table above as the category of “others” together. The peer correction in the present study refers to the way that teachers directly asked the peers for refined answers, and this functions as a way to indicate the emergence of errors:

Excerpt 1

Teacher: Ni zuo wan zuo le shen me? (What did you do last night?)

*Student A: Wo zuo wan kan dian ying. (I watch a movie last night. *)*

Teacher: (asking student B) Dui ma? (Is it correct?)

Alternatively, re-asking the same question, or the same question might be paraphrased by the teacher to elicit an accurate response from students:

Excerpt 2

Teacher: Ni zuo wan zuo le shen me? (What did you do last night?)

*Student A: Wo kan dian ying. (I watch a movie. *)*

*Teacher: Ni zuo **le** shen me? (What DID you do?)*

Or

Teacher: Ni zuo wan zuo le shen me? (What did you do last night?)

*Student A: Wo kan dian ying. (I watch a movie. *)*

Teacher: Wo xie le zuo ye, ni gan le shen me? (I did my homework, how about you?)

The final type is giving physical hints, for example; a pause or smile while giving no comments, gestures, head shake, or pointing at the proper linguistic items written on the blackboard.

3.2.2. Timing of offering the oral CF

As demonstrated in **Table 2**, the practices of three trainee teachers showed great similarity. Based on the statistics, it could be observed that over half of the feedback (60%) was provided right after the learners finished speaking, but with the same teaching task continuing at the same time, which, according to Brown ^[10] could be identified as online CF. Meanwhile, among teachers who also provided offline CF to the learners, 34% of the feedback was provided after the whole teaching task was finished. Moreover, a relatively low amount (3.6%) of oral CF emerged at the end of the class or in the middle of students' language flow (2.4%).

Table 2. The timing of offering the oral CF

Teacher	No. of feedback moves	Interrupt students' output	Student finishes speaking	Task completed	At the end of the class
Wan	50	1	36	13	0
Li	52	3	29	16	4
Yu	63	0	34	27	2
Total	165	4 (2.4%)	99 (60%)	56 (34%)	6 (3.6%)

3.2.3. Linguistic level addressed by the oral CF

Since the number of errors appearing in different classes is less likely to be stable, in the present study, the percentages were calculated in order to obtain a better understanding of the frequency of oral CF at each level of language (**Table 3**).

Table 3. Types of linguistic aspects that the oral CF address

Teacher	Phonology	Lexical	Grammatical	Pragmatic
Wan	17 errors 12 feedback (70.6% corrected)	11 errors 10 feedback (90.9% corrected)	30 errors 27 feedback (90% corrected)	3 errors 1 feedback (33.3% corrected)
Li	15 errors 9 feedback (60% corrected)	16 errors 12 feedback (75% corrected)	36 errors 31 feedback (86.1% corrected)	3 errors 0 feedback (0% corrected)
Yu	22 errors 20 feedback (90.9% corrected)	25 errors 20 feedback (80% corrected)	27 errors 21 feedback (77.8% corrected)	5 errors 2 feedback (40% corrected)
Total	54 errors 41 feedback (75.9% corrected)	52 errors 42 feedback (80.8% corrected)	93 errors 79 feedback (84.9% corrected)	11 errors 3 feedback (27.3% corrected)

According to the data generated from classroom observation, grammatical errors seemed to be addressed most frequently among the four types of errors, reaching 84.9%. Following the grammatical errors were the lexical and phonological errors that were corrected less regularly, at 80.8% and 75.9% respectively. Meanwhile, the pragmatic errors seemed to be targeted less frequently than the other three types, at only 27.3%. The similarity among them was that these teachers all gave the least attention to the pragmatic items.

3.3. The extent to which trainee teachers' stated beliefs match their teaching practices

Based on previous research, the comparison was made from four perspectives: namely, the frequency of offering

oral CF, the types of CF, the timing of offering oral CF as well as the linguistic levels that oral CF targets.

Based on **Table 4**, it was observed that there were discrepancies between Wan's stated beliefs and her actual practices. First of all, the amount of actual feedback moves is higher than estimated. With regards to the preferred CF categories during the teaching process, the estimated adopted sequence of CF types in the language classroom could generally correspond to the actual practices. However, there remain several differences. The main one is the contrast position of the recast. Finally, two other ways of giving feedback, apart from the proposed classification, were identified during observations: peer correction and giving physical hints, which include body language. For example, smiling and shaking the head, as well as pointing at the proper linguistic items written on the blackboard.

With respect to the timing of CF, the estimated perceptions match the teaching practices to a large extent. In addition to this, it was also noteworthy that two distinctive characteristics were found when observing the oral CF she offered to her students. First of all, when giving explicit feedback (recast and explicit correction) in response to students' problematic linguistic forms, the feedback was sometimes accompanied by encouragement or positive comments to the learners.

However, this method of giving oral CF could be more likely to cause confusion or misunderstanding among the learners. For instance, the positive comments offered with recast could distract learners' attention from the reformed items and mislead them, which may hamper students' uptake of the CF. The other feature is that when offering feedback on phonological errors, even if it was produced by an individual learner, Wan would still provide the feedback to the whole class; or she would ask every student to repeat the pronunciation one by one to make sure that the students tended to share an equal opportunity to learn pronunciation.

Table 4. Comparison between Wan's stated beliefs and observed teaching practices

	Stated	Observed
The amount of oral CF	50%	82.0%
The type of oral CF used	metalinguistic feedback > elicitation > explicit correction > repetition > recast > clarification request Other ways: peer correction	recast > elicitation > metalinguistic feedback > explicit correction = repetition Other ways: peer correction body language
The timing of oral CF	Agree: student finishes speaking = task is completed Neutral: interrupt students' output Disagree: the end of the class	Student finishes speaking > task is completed > interrupt students' output
The linguistics levels that oral CF address	Phonological 90% Lexical 90% Grammatical 90% Pragmatic 50%	Phonological 70.6% Lexical 90.9% Grammatical 90% Pragmatic 33.3%

Table 5 demonstrates Li's estimated perceptions and actual practices on CF during her teaching process. It was found that her beliefs and practices showed more discrepancies than Wan's. First of all, the observed amount of feedback moves (74.3%) is larger than the stated one (50%).

In terms of the preferred categories of oral CF used in the classroom, it seems that Li's perceptions of the effectiveness of each type could be reflected by her teaching practices, although some clear differences could be observed. However, there remains another kind of feedback category (peer correction) that Li fails to identify by herself. Apart from these, the beliefs and practices with respect to the timing of giving oral CF were found to be consistent to a large extent. The comparison of the targeted linguistic items shows an obvious mismatch

between her perceptions and practices. There are two things to notice here: one is that the phenomenon of offering phonological feedback to the whole class was also observed in Li's class; secondly, the actual pragmatic feedback is far less than estimated, at 0%. This means that no feedback is given to fix the pragmatic items, which could be an interesting phenomenon to look at, given that the main aim of the class is to foster learners' ability to generate realistic conversations in a classroom context.

Table 5. Comparison between Li's stated beliefs and observed teaching practices

	Stated	Observed
The amount of oral CF	50%	74.3%
The type of oral CF used	recast > clarification request > repetition > elicitation > explicit correction > metalinguistic feedback Other ways: no	recast > elicitation > explicit correction > repetition > clarification request > metalinguistic feedback Other ways: peer correction physical hints
The timing of oral CF	Agree: student finishes speaking = task is completed = the end of the class Neutral: interrupt students' output	student finishes speaking > task is completed > at the end of the class > interrupt students' output
The linguistics levels that oral CF address	Phonological 100% Lexical 60% Grammatical 60% Pragmatic 50%	Phonological 60% Lexical 75% Grammatical 86.1% Pragmatic 0%

As with the previous two participants, Yu's actual number of CF moves is also higher than she stated, at 79.7% compared to the estimate of 50% (**Table 6**). Nevertheless, she gave another reason for her choice. The priority in the class is to complete all the teaching tasks and cover the focused linguistic rules. In light of this, she will ignore some errors, allow peers to correct each other or just leave the questions to the students themselves.

In terms of the feedback preferences, it seems that the practices are relatively consistent with the stated ones. Although three other types of oral CF, other than the proposed six ones, were observed in her class: peer correction, body language, and re-asking the question, these were not reported in Yu's stated practices. As regards the timing of feedback, the data indicate that teaching practices are in line with the proposed perceptions. On the other hand, with linguistics levels, her practice differed from her estimated preference.

Table 6. Comparison between Yu's stated beliefs and teaching practices

	Stated	Observed
The amount of oral CF	50%	79.7%
The type of oral CF used	recast > elicitation > explicit correction > metalinguistic feedback > clarification request > repetition Other ways: no	recast > explicit correction > elicitation > metalinguistic feedback > repetition = clarification request Other ways: peer correction physical hints re-asking
The timing of oral CF	Agree: student finishes speaking > task is completed Disagree: the end of the class > interrupt students' output	student finishes speaking > task is completed > the end of class
The linguistics levels that oral CF address	Phonological 100% Lexical 50% Grammatical 75% Pragmatic 40%	Phonological 90.9% Lexical 80% Grammatical 77.8% Pragmatic 33.3%

4. Discussion

The present study explores Chinese trainee teachers' stated beliefs and the actual usage of oral CF in a CSL classroom teaching context. Compared with the previous studies, the results of this investigation demonstrate both similarity and discrepancy.

4.1. Trainee teachers' stated beliefs on classroom oral CF

First of all, the participants acknowledged the importance of the usage of oral CF, and they stated that they had considered the practicality of offering it in the Chinese as a second language teaching context. Therefore, according to their own report, it could be argued that they have a relatively clear understanding of CF practices in their lessons. However, this finding is not in line with previous research, which suggests that novice teachers tend not to have such a clear conception of oral CF ^[16]. The reason for this might be that the targeted group in the present study is relatively small and not representative enough. Moreover, the participants were all recruited from the same teacher training program. Therefore, it is possible that they have been exposed to related content and knowledge about oral CF within that training process.

Furthermore, with respect to the amount of oral CF in class, the trainee teachers argued that they would only correct around half of the errors occurring during the class. This number echoes the feedback amount in similar studies ^[7]. The reasons they propose to support their choice are twofold: the positive influences of oral CF to validate the employment of it in class; for example, the provision of accurate language input to facilitate language learning ^[6,31] to meet students' expectations ^[32]. However, there are also potential constraints during the class: for instance, the time constraint, the pressure from the institution, the focus of classroom activity, and students' affective issues. These limitations are also mentioned and discussed in previous research ^[30,32,33].

When considering the effectiveness of different types of CF, they argue that elicitation and repetition are the most effective types, which is in line with the previous study carried out by Sepehrinia and Mehdizadeh ^[32]. Finally, the participants also recognized the essential value of phonology in the second language learning context. The status of pronunciation is especially highly rated in the Chinese as a second language learning context ^[34].

4.2. Trainee teachers' pedagogical practices in class

Regarding the classroom teaching practices of the trainee teachers, the actual amount of oral CF provided is around 78% of the errors that occur in class. This number is relatively higher than previous research, which is normally within the range of 30–70% ^[20]. An even lower rate of error correction was observed in the EFL classroom in a Chinese middle school, which was around 6 feedback per hour ^[35], whereas in the present research was 37 moves per hour. The amount of oral CF is especially high in this context since novice teachers or trainee teachers are inclined to give less feedback than experienced teachers. It is shown that inexperienced teachers are more likely to stick to their original teaching plans instead of noticing the potential learning opportunities for their students and expanding the teaching content. This result could be attributed to the nature of class activities. During the teaching task, the learners were asked to answer questions using the given grammar, which tends to focus more on the language forms.

Among the feedback categories, recast is the most often adopted type of CF, and this finding is consistent with similar studies, such as Panova and Lyster ^[8], Sheen ^[9], Roothoof ^[13], and Kamiya ^[12]. Recast is preferred by the teachers because this type of CF is less likely to challenge and embarrass the students, especially when the students are adults ^[2]. This concern is especially obvious within the inexperienced teacher groups.

Furthermore, recast could also help with saving more time during the class. However, the effectiveness of recast is rather questionable, since it is relatively implicit ^[7,8,36]. This problem could be especially obvious in Wan's class since she treated students' errors with compliments and recast feedback, which could be confusing for the learners.

Additionally, apart from the adopted classification, three other ways of giving feedback are also observed in class. However, these methods have also been identified in previous research ^[20,37,38], which suggests that the present results are consistent with the existing outcomes. Meanwhile, the wide usage of recast and explicit correction in the present study also indicates that teachers are expected to be the main sources of knowledge. A similar assumption has been discussed in a similar study carried out in an Iranian context ^[32]. This tendency could also be noticed in the participants' perceptions. Hence, it could be argued that teacher-centered classroom teaching is more accepted and employed in the CSL context, which further emphasizes the importance of understanding the teachers' perceptions.

In terms of the linguistic aspects that oral CF addresses, on average, grammatical errors are the ones that are mostly addressed in the present study. This finding echoes the previous research to some extent since it identified that phonological and grammatical errors are the ones most frequently targeted ^[39]. Although these lessons aim to develop students' language ability in a daily communicative context, the pragmatic items in the observed classes, as well as in the stated conceptions, are the elements least focused on. The reason behind this might be the relatively low language proficiency of the learners since offering a large amount of pragmatic feedback might cause learners to be confused. Scholars have verified that the rates of noticing pragmatic errors and absorbing pragmatic feedback are significantly related to their language proficiency. The higher the language proficiency level, the easier for learners to understand and internalize the pragmatic feedback offered to them.

Meanwhile, individual differences could also be observed in the present research, which indicates that the teaching training program might not be the only influence on trainee teachers' practices and beliefs ^[40]. Borg ^[41] suggested previous language learning experiences could exert an influence on pre-service teachers' knowledge and perceptions of language teaching.

4.3. The relationship between trainee teachers' stated beliefs and teaching practices in CSL classroom

When bringing trainee teachers' stated beliefs and teaching practices together, the present research shows that although there are several similarities, an inconsistency is still observed. The similarity between beliefs and practices was identified in terms of the proper timing. The trainee teachers in this investigation are inclined to give the feedback right after students have finished speaking but still within the communicative task (i.e. online oral CF).

The most overt mismatch occurs when discussing the frequency and methods of offering oral CF in class. This outcome echoes previous research which also indicated the differences between theoretical beliefs and pedagogical practices ^[2,19]. The possible reason behind this discrepancy could come from different perspectives. A large number of researchers have proposed possible reasons before, for example, the context constraint includes the time limit, classroom activities, instructional focus, the number of errors arising ^[32], contextual pressure ^[33], learners' language proficiency, age, personality ^[4], classroom size, etc. Alternatively, it could also be attributed to the teachers' thoughts, for instance, in considering the learners' affective issues. Another reason could be that the participant group was trainee teachers. According to previous studies, trainee or novice

teachers tend to have more difficulty in putting their perceptions into practice^[16]. Apart from this, the oral CF of the current study is a kind of incidental feedback, and this further adds to the difficulty of applying the beliefs to reality^[20].

The existence of the new type of CF (i.e. giving physical hints), and the strategy of offering corrective feedback with compliments, as well as the relatively large amount of explicit feedback in class, reflect trainee teachers' concerns about students' affective issues. This characteristic echoes the findings in previous studies, which also suggest that trainee teachers would pay more attention to learners' affective issues during the teaching process. Some of the teachers' choices were based on their assumptions about the students' expectations.

To sum up, it could be noticed that most of the findings could correspond to the previous studies, which indicates that the oral CF in the CSL context has considerable similarities with those in other contexts, for example, ESL and EFL contexts. According to the findings, the particularity of the present study lies in two aspects: the relatively clearer self-decription of the trainee teachers and the higher amount of oral CF practices in the classroom.

5. Conclusion

The present study revealed the dynamic relationship between trainee teachers' perceptions and their teaching practices. The discrepancy between trainee teachers' stated beliefs and teaching process is clearly observed in this study, and the possible reasons behind this mismatch could be from dual aspects. Although this study only provides a small group of classroom observations, it still serves as an indication of the present teaching reality in a CSL context, and some interesting points were found during the exploration.

Trainee teachers' beliefs are less likely to be fully reflected in their practices due to the complications and dynamics of the teaching classroom. Therefore, the discrepancy in the current study could be because the busy classroom is, as yet, beyond the trainee teachers' ability to fully understand and control. Considering this, Chinese trainee teachers tend to need more assistance when offering relatively complicated CF. For example, more support in the teacher training program could be beneficial to the development of their teaching ability^[16,42]. Offering the trainee teachers a more comprehensive understanding of the complex classroom context as well as more opportunities to conduct practice-oriented training tasks would help them to gain a better understanding of the nature of CF, and this could be constantly referred to during the pedagogical activities^[43,44], which, presumably would further support the teachers to deliver proper oral CF in the future.

In conclusion, the native Chinese trainee teachers play a crucial role in delivering the oral CF in CSL classroom context, meanwhile, they tend to take into consideration their students' affective needs when offering the oral CF. Chinese trainee teachers are inclined to have a clear conception of the usage of oral CF in class when referring to their self-report. However, these perceptions are not necessarily in line with their actual teaching practices. The reason behind the mismatch might be the constraints in complex classroom contexts, the different features of learners, or the inadequacy of the teacher training program. The current study offers a glimpse of the relationship between trainee teachers' stated beliefs and teaching practices of oral CF in the CSL context. Given the dynamic relationship between one another, further studies would be valuable to shed light on the complex contextual issues in the field of oral CF in CSL or CFL classrooms.