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Research on the Construction and Practice of an Intelligent Evaluation System for Cultivating Computational Thinking in Vocational College Students

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Abstract: Based on the needs of curriculum reform in information technology courses in vocational colleges, this study innovatively constructs a vocational scenario-driven intelligent evaluation system. Aiming at the cognitive characteristics of vocational college students, it establishes a mapping model between computational thinking and vocational ability by capturing behavioral trajectories in the process of solving real tasks, realizing dynamic diagnosis and personalized intervention. Practice shows that the system effectively bridges the gap between skill training and thinking cultivation, providing a replicable technical solution to solve the teaching dilemma of information technology in vocational colleges.

Keywords: Vocational Information Technology; Computational Thinking; Vocational Ability; Intelligent Evaluation; Personalized Learning

1. Realistic Dilemmas and Breakthrough Paths in Information Technology Teaching in Vocational Colleges

Current information technology courses in vocational colleges face three major structural contradictions. Firstly, there is a mismatch between teaching objectives and students' academic foundations. Vocational college students generally have advantages in image thinking but are weak in abstract reasoning ability. Traditional skill training centered on Office software operations is difficult to support the requirements of emerging positions such as intelligent manufacturing and digital commerce for systematic problem-solving abilities. When students face logistics data analysis tasks that require multi-step coordination, they often fall into the predicament of "knowing the functions of each button but being unable to construct a complete solution". Secondly, it stems from the lag of the evaluation mechanism. Relying on final written exams and isolated operation questions for evaluation, it is impossible to capture students' thinking processes in real projects, and teachers find it difficult to diagnose deep-seated problems such as "why the data verification link is always ignored". A deeper contradiction lies in the disconnection between courses and vocational scenarios. Surveys show that 72% of vocational college students believe that "textbook cases have nothing to do with their future work", leading to the attenuation of learning motivation.

To solve these problems, this study proposes a three-in-one reform path of "vocational context embedding - ability behavior modeling - data-driven diagnosis". Its core proposition is: how to transform computational thinking, an abstract literacy, into observable, evaluable, and improvable vocational behavior ability? Intelligent evaluation technology provides a new possibility for this.

2. System Construction: Design Logic Anchored by Vocational Ability

2.1 Design of Ability Transformation Model

Based on the analysis of post ability in regional manufacturing and e-commerce enterprises, we concretize computational thinking into four cultivable vocational ability dimensions. Systematic decomposition ability requires students to decompose complex tasks into standardized modules such as data

collection, rule verification, calculation engine, and output control, just like warehouse managers handle orders. Pattern abstraction ability is reflected in discovering rules from massive data, for example, logistics specialists extract optimal path decision rules from dispatch records. The ability to algorithmically solve problems is manifested in designing automated processes, such as marketing specialists establishing a mechanism for user behavior to trigger email pushes. Iterative optimization ability requires continuous improvement of solutions based on feedback, just as new media operations adjust information display strategies according to click-through rates.

2.2 Practice-Oriented System Architecture

The entire system adopts a closed-loop architecture of "context bearing - behavior capture - diagnosis and feedback". In the context creation layer, five types of real enterprise cases have been developed. Among them, the intelligent warehouse dashboard case requires students to integrate sensor data, inventory thresholds, and visual reports; the cross-border e-commerce case needs to analyze the conversion rate of advertising placement and optimize budget allocation. These cases are developed through school-enterprise cooperation to ensure that each task maps to specific post scenarios.

The behavior capture layer deploys lightweight collection tools, focusing on observing four types of key behaviors: the path trajectory of students building task frameworks in the flowchart editor, exposing the logical integrity of their systematic decomposition; the selection of functions and parameter configuration behaviors when processing data, reflecting the level of algorithmic thinking; breakpoint setting and variable monitoring strategies during debugging, reflecting problem positioning ability; the quality of questions and conceptual expressions in the collaboration platform, revealing metacognitive status. For example, when a student repeatedly modifies the inventory calculation formula but ignores boundary value testing, the system will capture the signal of "weak evaluation ability".

The diagnostic engine adopts a dual-channel analysis mechanism. The horizontal channel matches students' behaviors with the enterprise post ability model. For example, when a student frequently uses basic formulas and ignores the pivot table function when completing an e-commerce report task, the system will generate an early warning that "the application of data analysis tools does not meet the standards of the operation assistant post". The vertical channel analyzes the evolution trend of ability through time series, such as tracking the progress of students from simple summation to writing macro commands, and identifying key nodes of ability leap.

3. Teaching Implementation: A Practical Paradigm of Hierarchical Empowerment

In teaching practice, we have observed typical ability growth trajectories. Taking the "intelligent replenishment system design" task as an example, students need to establish an early warning model based on historical sales data. For the underfunded group, when the system detects that they directly write complex formulas leading to errors, it automatically pushes the "four-step decomposition method" micro-course: the first step is to locate the key fields of commodity numbers and inventory quantities, the second step is to define safety threshold rules, the third step is to build a calculation model of "current inventory - average daily sales × replenishment cycle", and the fourth step is to set visual early warning signs. This structured guidance significantly reduces cognitive load.

Students with moderate ability will trigger in-depth thinking prompts. When the system finds that a student stagnates after completing the basic model, it guides them to think through a pop-up window: "Consider incorporating promotional activity factors into calculation variables" and "Try to use conditional formatting to distinguish out-of-stock levels". Such prompts promote students to advance from operation execution to strategy optimization.

For top performers, the system opens an innovation challenge channel. After completing the basic task, a student received a suggestion: "Design a script for automatically generating replenishment emails, which should include commodity numbers, out-of-stock quantities, and supplier contact information". The student finally realized the

linkage between the email template and the database by consulting enterprise API documents, and this process transformed him from a tool user to a solution designer.

The evaluation of enterprise tutors confirms the value of the system. A logistics supervisor pointed out: "Interns in the experimental group can quickly understand the logic of the WMS system and take the initiative to propose optimization schemes for cargo location allocation using pivot tables. This awareness of improvement based on systematic thinking is far beyond the level of ordinary operators."

4. Empirical Effects: Verification of Multi-Dimensional Evidence Chains

4.1 Quantitative Data Reveal Ability Leap

Students in the experimental group showed significant progress in vocational ability assessment. When dealing with real enterprise sales report tasks, the average time was reduced from 98 minutes to 63 minutes. This efficiency improvement stems from the structured thinking habits formed by system training. More importantly, there is a change in the quality of solutions. The proportion of solutions meeting job requirements increased from 41% to 79%. A typical example is that the data dashboard designed by a student was directly adopted by the enterprise as a weekly meeting template. In the new scenario migration test, 76% of the students in the experimental group could correctly apply thinking tools in customer complaint analysis tasks, 32 percentage points higher than the control group, proving that the internalization and migration of ability has occurred.

4.2 Qualitative Evidence Shows Cognitive Changes

Students' learning reflections reveal profound changes. Wang, a mechanical major, wrote: "I used to think that Excel was just filling in grids, but now I understand that every formula is building a business logic chain. Last week, when analyzing equipment failure rates, I took the initiative to establish a correlation model of 'failure type - time distribution - maintenance cost', which made me understand the core value of information technology." Teacher observation logs record behavioral evolution: the proportion of students in the experimental group who checked logs when debugging formula errors increased from 18% to 67%, indicating a shift from blind trial and error to systematic diagnosis.

4.3 Enterprise Feedback Confirms Vocational Adaptation

E-commerce enterprises participating in school-enterprise cooperation provide key evidence: the error rate of interns in the experimental group in processing order data is only 1/3 of that in the control group, and they can take the initiative to put forward optimization suggestions such as "using VLOOKUP function to automatically match customer levels". The human resources director particularly emphasized: "The systematic problem-solving ability shown by these students is exactly the core standard for us to promote reserve cadres."

5. Discussion: Key Strategies for Vocational College Implementation

5.1 Innovative Mechanisms to Solve Teaching Pain Points

The core value of this system lies in establishing an accurate channel for ability cultivation. Facing the differences in vocational college students' foundations, the system realizes hierarchical empowerment of "different guidance for the same task" through behavior diagnosis, avoiding the sense of frustration caused by "one-size-fits-all" teaching. To address the problem of learning motivation, real enterprise cases enable students to intuitively experience the value of ability. For example, after completing the intelligent warehouse task, students exclaimed: "It turns out there is such a data logic behind supermarket shelf replenishment!" In the dimension of evaluation reform, process data visualize abilities, and teachers can accurately locate the weak points of the group. For example, after finding that 65% of students ignore the data verification link, they carry out targeted data literacy training.

5.2 Practical Wisdom in Implementation Paths

Scenario design should be closely linked to regional economic characteristics: develop equipment predictive maintenance cases for equipment manufacturing majors and design user behavior analysis tasks for business majors to ensure that teaching and industrial needs resonate at the same frequency. The technical deployment adopts B/S architecture to develop a lightweight platform, which runs smoothly on computer room equipment with

2GB memory, breaking through the hardware constraints of vocational colleges. In terms of teacher development, a "Diagnostic Report Teaching Transformation Guide" is developed to guide teachers to transform system prompts into classroom decisions. For example, when the report shows that students' abstract ability is weak, a "variable naming workshop" can be organized to train semantic expression ability with examples such as using "total commodity quantity" instead of "data1".

5.3 Ethical Considerations in Risk Prevention and Control

Establish strict data security mechanisms: enterprise raw data are desensitized before use, and only behavioral characteristic data are retained; set ability early warning thresholds, and when students are continuously at a low level, manual intervention is initiated to avoid technology replacing the educational essence of teachers. In a certain practice, the system detected that three students repeatedly skipped the task decomposition step, and the teacher promptly intervened in group scaffolding teaching, finally helping them break through the thinking bottleneck.

6. Conclusion and Extension

The intelligent evaluation system constructed in this study has achieved three major breakthroughs: transforming abstract computational thinking into observable vocational behaviors, realizing accurate ability improvement through dynamic diagnosis, and building a bridge between curriculum teaching and enterprise needs. These breakthroughs essentially reconstruct the ability cultivation paradigm of information technology courses in vocational colleges - from fragmented skill training to systematic thinking cultivation.

References

[1] Zhu Lihua et al. "Application of Computational Thinking in Information Technology Concept Teaching." Computer and Telecommunication 12(2017):3.

[2] Nie Ru, Li Zhengwei. "Research on Reform and Practice of College Computer Basic Teaching with the Goal of Cultivating Computational Thinking." (2024).

[3] Wei Yanz. "Innovation of Computer Basic Teaching Model Based on Computational Thinking." Proceedings of the 2025 Academic Symposium of Guangdong Education Association (2).

[4] Xiang Xi. Research on Interdisciplinary Teaching Design and Empirical Study of Junior High School Information Technology Based on Computational Thinking[D]. Shanxi Normal University, 2023.

Research on the Integration Mechanism of College Students' Innovation and Entrepreneurship Education with Ideological and Political Education from the Perspective of New Quality Productivity

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Abstract: Innovation constitutes the core of new quality productivity. As a pivotal hub for the integrated development of education, technology, and talent, universities urgently need to strengthen ideological guidance within innovation and entrepreneurship education to cultivate high-quality talents aligned with the demands of new quality productivity. Guided by the theoretical essence of new quality productivity, this study systematically examines practical challenges in the integration of college students' innovation and entrepreneurship education and ideological and political education, focusing on goal alignment, content integration, methodological innovation, faculty competence, and coordination mechanisms. A "value orientation - capability cultivation - practical empowerment" tri-dimensional educational framework is proposed to promote the deep integration of ideological and political education with innovation and entrepreneurship education. This approach aims to nurture talents equipped with patriotism, innovative spirit, and practical capabilities, thereby supporting the nation's high-quality development.

Keywords: New quality productivity; Innovation and entrepreneurship education; Ideological and political education; Collaborative education; Talent development

1. INTRODUCTION

General Secretary Xi Jinping's seminal discourses on developing new quality productivity emphasize that innovation serves as the primary driver of progress. In this historic transformation, universities—where science and technology, talent resources, and innovation converge—bear the critical mission of cultivating talents to advance China's modernization through new quality productivity (Wang, 2024).

College students' innovation and entrepreneurship education represents the core mechanism for fostering talents aligned with new quality productivity (Wang, 2025). Such talents require not only robust professional expertise and exceptional innovation capabilities but also profound patriotism, firm ideological convictions, correct value orientations, and strong social responsibility. Ideological and political education (hereinafter referred to as "ideological education") is indispensable for fulfilling the fundamental task of moral cultivation and talent development. It plays an irreplaceable role in shaping students' worldviews, life philosophies, and value systems while stimulating intrinsic motivation for innovation-driven national contributions (Huang, 2025; Hu *et al.,* 2024). Consequently, deeply integrating ideological education into new quality productivity development to achieve organic unity between value guidance and capability cultivation has become an urgent priority for university talent development reforms.

This study addresses the new quality requirements for innovative talents under new quality productivity, focusing on practical challenges in integrating college students'

innovation and entrepreneurship education with ideological education. It explores pathways for bidirectional empowerment, aiming to provide theoretical frameworks and practical strategies to enhance university talent cultivation quality and support the development of new quality productivity.

2. THE INTRINSIC LINK BETWEEN NEW QUALITY PRODUCTIVITY AND IDEOLOGICAL AND POLITICAL EDUCATION IN INNOVATION AND ENTREPRENEURSHIP

New quality productivity arises from revolutionary technological breakthroughs, innovative allocation of production factors, and deep industrial transformation (Wang, 2025). This demands talent with interdisciplinary knowledge, digital/intelligent literacy, national commitment, and entrepreneurial spirit (Sun *et al.,* 2025), necessitating a shift from traditional models to a paradigm integrating value orientation, capability building, and practical empowerment.

Ideological and political education supports innovation and entrepreneurship through three pathways. First, it provides value guidance by promoting Marxism and the spirit of scientists, redirecting students from utilitarian goals to serving the nation via science/technology. Second, it cultivates non-cognitive traits like perseverance, resilience, and teamwork. Third, it offers methodological tools—such as dialectical materialism—to enhance systematic, forward-looking innovation, aligning with industrial and societal needs (Huang, 2025; Hu *et al.,* 2024).

Innovation and entrepreneurship practices deepen ideological education’s effectiveness. By solving technological challenges and competing in markets, students convert theoretical knowledge into action, strengthening their sense of responsibility. the tangible social impact of their innovations reinforces the understanding that personal growth and societal contribution are intertwined, creating a feedback loop that enhances both educational outcomes and productivity advancements.

3. CURRENT CHALLENGES IN IDEOLOGICAL AND POLITICAL EDUCATION FOR COLLEGE STUDENTS' INNOVATION AND ENTREPRENEURSHIP FROM THE PERSPECTIVE OF NEW QUALITY PRODUCTIVITY

Although the necessity and value of integrating innovation and entrepreneurship education with ideological and political education are increasingly recognized, universities still face significant challenges in effectively coordinating the two, which fall short of meeting the development requirements of new quality productivity: (1) Misalignment in Goal Integration: the "Dualism" of Value Guidance and Competency Development. In some innovation and entrepreneurship courses or projects, the objectives of value guidance are vague or overly general, failing to closely align with the concrete demands of new quality productivity. (2) Insufficient Integration of Content: Ideological and political education lacks deep, organic integration with specific professional knowledge, technical principles, and innovation cases. (3) Limited Methodological Approaches: Inadequate Digital Empowerment and Lack of Practical Platforms. (4) Faculty Capability Gaps: the Disconnection Between "Innovation & Entrepreneurship Mentors" and "Ideological Educators". (5) Ineffective Coordination Mechanisms: There is insufficient collaboration among university administrative departments, academic schools, and enterprises, leading to fragmented resources.

4. OPTIMIZATION PATHS FOR IDEOLOGICAL AND POLITICAL EDUCATION IN COLLEGE STUDENTS' INNOVATION AND ENTREPRENEURSHIP LED BY NEW PRODUCTIVE FORCES

In response to the aforementioned practical dilemmas, it is urgent to construct a new integrated education ecosystem oriented by the needs of new productive forces, with ideological and political education as its soul, and supported by innovation and entrepreneurship capabilities.

Strengthening Value Guidance: Anchoring the National Coordinates for the Development of New Productive Forces

Clarifying the integrated goal system: Taking "cultivating innovative entrepreneurs with both virtue and ability who serve the

development of new productive forces" as the core goal.

Digging deep into ideological and political elements:

Integrating national strategies: Taking major national strategic needs such as self-reliance and self-improvement in science and technology, a strong manufacturing country, a strong cyber country, a digital China, and the dual-carbon goals as the value origin of innovation and entrepreneurship projects. Telling good stories of the times: Selecting outstanding deeds of scientists, engineers, and entrepreneurs (especially alumni) who have emerged in breaking through "bottleneck" technologies, developing emerging industries, and practicing green innovation as vivid teaching materials. Focusing on cutting-edge ethics: Incorporating ethical and legal issues associated with new productive forces, such as artificial intelligence ethics, data security and privacy protection, biotechnological security, and platform economic governance, into the compulsory content of innovation and entrepreneurship, and conducting case discussions and scenario simulations.

4.1 Deepening Content Integration: Building an Integrated Curriculum Group of "New Productivity • Innovation and Entrepreneurship • Ideological and Political Education"

Systematically embedding modules such as "New Productive Forces and the Mission of the Times", "Innovation Ethics and Technology for Good", "Entrepreneurial Spirit and Social Responsibility", and "Intellectual Property and National Innovation System" into courses like Fundamentals of Innovation and Entrepreneurship. In professional courses, combined with disciplinary frontiers (such as artificial intelligence, new energy, and biomedicine), develop a characteristic case database of "major+new productive forces+ideological and political education". Offer frontier lectures/workshops on "Future Industry Innovation and Entrepreneurship", inviting leading scientific and technological talents, policy researchers, and ethics scholars to teach together.

4.2 Innovating Teaching Methods: Digital Intelligence Empowerment and Scenario-Based Practice

4.2.1Utilizing digital intelligence technologies:

Building a "Smart Innovation and Entrepreneurship Ideological and Political Cloud Platform": Integrating functions such as online courses, virtual simulation experiments (e. g., simulating decision-making in technological ethical dilemmas), project management systems, tutor matching, resource connection, achievement display, and value evaluation. Using big data to analyze students' learning behaviors and project data, accurately identify deviations in value cognition or practical confusion, and provide personalized ideological and political guidance and resource push.

4.2.2Deepening Industry-Education Integration: Building Collaborative Practice Platforms

Establish long-term, stable partnerships with frontier technology enterprises, national laboratories, emerging R&D institutions, and specialized, refined, distinctive, and innovative enterprises to create internship, project development, and entrepreneurship incubation bases. During technology transfer processes, establish an ethical review mechanism to assess socioeconomic benefits, environmental impact, and potential risks, guiding students toward "responsible innovation. "

4.3 Deepening Industry-Education Integration: Building Collaborative Practice Platforms

Establish long-term, stable partnerships with frontier technology enterprises, national laboratories, emerging R&D institutions, and specialized, refined, distinctive, and innovative enterprises to create internship, project development, and entrepreneurship incubation bases. Prioritize real-world technological needs of enterprises and solutions to industry pain points as core themes for student projects. Organize participation in high-level competitions such as the "Internet+" Innovation and Entrepreneurship Competition and the "Challenge Cup, " aligning competition projects with practical challenges in advancing new productive forces and supporting local industrial upgrading. Explore integrating social responsibility fulfillment and sustainable development contributions into competition evaluation criteria. During

technology transfer processes, establish an ethical review mechanism to assess socioeconomic benefits, environmental impact, and potential risks, guiding students toward "responsible innovation. "

4.4 Enhancing Faculty Competencies: Cultivating a "Dual-Qualified, Triple-Capability" Educator Team

4.4.1Ideological and Political Educators

Organize thematic workshops, enterprise field visits, and lectures on cutting-edge technologies to deepen educators' understanding of emerging technologies, industries, and economic trends. Train them to design pedagogical strategies that integrate ideological elements into innovation and entrepreneurship contexts.

4.4.2Subject-Specific/Innovation & Entrepreneurship Educators

Conduct specialized training on curriculum-based ideological education to strengthen educators' conscious awareness and capability in value guidance. Encourage participation in industry-academia collaboration projects to accumulate practical experience.

4.4.3 Recruiting and Cultivating "Dual-Qualified" Mentors

Hire entrepreneurs, engineers, and investors with strong industry backgrounds and social responsibility as external mentors. Pair them with on-campus faculty to create synergistic mentorship teams focused on holistic student development.

4.5 Improving the Collaborative Ecosystem: Strengthening Institutional Support and Resource Integration

4.5.1Strengthen top-level design and collaborative mechanisms, and establish cross-departmental platforms for information sharing and project collaboration.

4.5.2Optimize the evaluation and incentive mechanism: In the outcome evaluation system for innovation and entrepreneurship, significantly increase the weight of dimensions such as the project's social value, ethical performance, sustainability contribution, team collaboration spirit, and the embodiment of patriotism and national commitment. Explore diverse evaluation approaches, such as growth portfolios, reflective reports, peer reviews, and social feedback. Effectively integrating ideological and political education into innovation and entrepreneurship education and achieving notable educational outcomes should be included as key indicators in faculty performance appraisals, title promotions, and excellence awards.

4.5.3Construct a resource guarantee system: Establish a special fund titled "Innovation and Entrepreneurship Ideological Education for Emerging Productive Forces", to support curriculum development, textbook compilation, case studies, practical projects, and faculty training. Integrate both internal and external resources—such as enterprises, government agencies, research institutes, venture capital organizations, and alumni networks—to build a "Resource Repository for Emerging Innovation and Entrepreneurship Ideological Education", offering students comprehensive support in projects, funding, technology, mentorship, and more. This will help establish a full-cycle innovation and entrepreneurship ecosystem.

5. CONCLUSION

Developing emerging productive forces is an intrinsic requirement and a key focal point for promoting high-quality development. Innovation and entrepreneurship capabilities constitute the "hard power, " while ideological and political literacy serves as the "soft power" and "original driving force"—both are indispensable. Based on an in-depth analysis of the connotations of emerging productive forces and the associated talent demands, this study identifies the major challenges currently facing ideological and political education in university-level innovation and entrepreneurship, particularly in terms of goal alignment, content integration, methodological innovation, faculty capacity, and collaborative mechanisms.

To address these challenges, it is urgently necessary to construct a new educational ecosystem that is led by national strategic needs, guided by ideological values, supported by innovation and entrepreneurship practices, empowered by digital and intelligent technologies, and safeguarded through multi-stakeholder collaboration. By reinforcing value orientation to set clear directions, deepening content integration to develop high-quality courses, innovating teaching methods to enhance experiential learning, improving faculty capabilities as a foundational element,

and refining collaborative mechanisms to pool collective strengths, we can achieve deep integration and mutual reinforcement between ideological and political education and innovation and entrepreneurship education.

REFERENCES

[1] HE M Y. Dilemmas and pathways in cultivating innovative talents from the perspective of emerging productive forces [J]. Teaching in Forestry Regions, 2025(7):46–49.
[2] YANG D J, WU S, WANG T. Mutual empowerment between emerging productive forces and employment-oriented education in universities: internal logic and practical pathways [J]. Journal of China University Students Employment, 2025(6):50–60.
[3] SUN J Y, LIU W, YANG D, et al. Exploration of an innovation capability cultivation model for multi-dimensional composite talents under the background of emerging productive forces [J]. Research in Higher Engineering Education, 2025(S1):218–223.
[4] WANG B W. Empowering emerging productive forces through innovation and entrepreneurship education in universities: internal mechanisms, practical obstacles, and implementation pathways [J]. Theory and Practice of Education, 2025, 45(15):3–7.
[5] GUO L X. Exploration of innovation ability cultivation for college students in the new era [J]. Party Building and Ideological Education in Schools, 2025(6):78–80.
[6] HUANG Y J. Strategies for enhancing college students' innovation and entrepreneurship capabilities through ideological and political courses in the new era [J]. University, 2025(7):167–170.
[7] HU X X, ZHAO Q, PANG D D, et al. Role positioning and implementation pathways of university counselors in innovation and entrepreneurship education under the perspective of emerging productive forces [J]. Employment and Security, 2024(12):24–26.
[8] HUANG G, LIU J Q. Exploration of applied innovation talent cultivation under the background of developing emerging productive forces [J]. Party Building and Ideological Education in Schools, 2024(22):8–11.
[9] SHENG M J. Triple logic in cultivating college students' innovation and entrepreneurship spirit in the new era under the perspective of emerging productive forces [J]. Continental Bridge Vision, 2024(7):47–49.

Analysis of the Operational Efficiency of Maker Spaces in Shandong Province and Research on the Influencing Factors

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Abstract: Since the launch of China's national "Mass Entrepreneurship and Innovation" initiative in 2015, a wave of innovation and entrepreneurship has swept across the country. Maker spaces, as emerging service platforms for innovation and entrepreneurship, have experienced explosive growth in number. However, reports of high vacancy rates and insufficient profitability among these spaces are rampant, while issues such as severe homogenization and excessive reliance on government subsidies plague their sustainable development. Currently, academic research on the operational efficiency of maker spaces remains limited. It is therefore necessary to analyze their operational efficiency and provide suggestions to enhance their development level and improve their operational performance.

Keywords: Maker space; Operating efficiency; Data envelopment analysis; Exploratory spatial data analysis

1. INTRODUCTION

The United Nations' 2022 World Economic Situation Prospects report states that the global economy is under pressure due to the ongoing COVID-19 outbreak. This is in addition to labor market issues and rising inflationary pressures. Governments have realized that the key drivers of global economic recovery and growth can only be achieved through innovation. the Chinese government, from the outset, elevated creation to the status of a national strategy to keep pace with the times. the Chinese government proposed an Innovation-driven Development Strategy in 2012, and "Widespread Entrepreneurship and Innovation" was introduced in 2014. In this context, China has implemented policies to support innovation, entrepreneurship, and the development of mass maker spaces. These policies have enabled them to develop rapidly. Various regions have established numerous mass maker spaces due to relevant national policies. As a brand-new innovation and entrepreneurship platform, mass maker spaces significantly optimize the entrepreneurial environment and promote social employment. With its extensive experience in entrepreneurial strategy and business management, it is well-positioned to assist start-ups and compensate for their inexperience. Nevertheless, there have been many problems with the development of mass maker spaces, including reports of high vacancy rates and low operational efficiency, an over-reliance on government subsidies, and serious homogenization. Mass maker spaces face these issues that limit their sustainable development. Therefore, it is crucial to explore in depth how to improve the outcome of mass maker spaces and maximize their effectiveness.

Even so, there are few empirical studies on the operational efficiency of mass maker spaces in academia. Most of these studies investigate the operational efficiency of incubators, and fewer have systematically investigated the operational efficiency of mass maker spaces. Given this, this study plans to conduct a scientific analysis of the operational efficiency of mass maker spaces in Shandong Province from the perspective of the input and output of maker space resources in Shandong Province, using the Data Envelopment Analysis method and Grounded Theory. Moreover, analyze the current problems and shortcomings and puts forward opinions and suggestions to improve the allocation of resources, optimize the

operation mode and promote the high-quality development of mass maker spaces.

2. RESEARCH BACKGROUND

the premier of china, li keqiang, stated at the 2014 summer davos forum that innovation for all is vital to china's economic transformation and growth. the chinese government places a high value on innovation and entrepreneurship, and the term "maker" was included in the government work report for the first time in 2015. as a result, mass maker spaces are rapidly developing and becoming a new engine for economic growth. this study aims to assemble and analyze shandong province's national mass maker spaces. the study examines the operational efficiency of mass maker spaces in the shandong province, identifies existing problems and shortcomings, and suggests targeted solutions.

2.1 Background of mass maker spaces operational efficiency

Farrell, a British Cambridge economist, introduced the concept of technical efficiency in 1957. In terms of inputs, he defined *technical efficiency* as the percentage of the minimum cost required to produce a given product divided by the actual price. This is the result of a given ratio of input factors. In 1966, Leibenstein defined *technical efficiency* as the ratio of actual output to the maximum ideal production for an equal number of inputs. Simar introduced the concept of efficiency in 2011, which refers to using the minimum amount of information for the same output or maximizing output for the same inputs.

With the introduction and continuous development of the concept of mass maker spaces, scholars have extended the definition of efficiency and research methods in economics to the field of mass maker spaces. On this basis, scholars have derived a definition of efficiency in maker spaces, i. e., using minimal inputs under the same output conditions or maximizing output under the same input conditions. China has only been developing mass maker spaces for seven years, and theoretical research has just begun. As mass maker spaces are derived from traditional maker spaces and incubators, there are certain commonalities regarding operational efficiency. In conclusion, the research on the operational efficiency of mass maker spaces in China is based on the operational efficiency of incubators in China and abroad.

2.2 Background of mass maker spaces in China

The Chinese government released a series of policy documents to promote innovation and entrepreneurship development actively. In 2015, the General Office of the State Council of the People's Republic of China issued the "Guiding Opinions on the Development of Mass Maker Spaces to Promote Mass Innovation and Entrepreneurship" document, which outlines the nature of crowd creation spaces and the rationale for their development. As a brand-new type of entrepreneurial service platform with openness, facilitation, mutual benefit, and a win-win situation, mass maker space provides professional innovation and entrepreneurship incubation services, along with capitalization through market-based mechanisms, which constitutes a new type of entrepreneurial service platform (the General Office of the State Council of the People's Republic of China, 2015).

The latest China Torch Statistical Yearbook 2021 reports that by the end of 2020, 8, 507 mass maker spaces will be operating across the country. This is an increase of 6.34% from the previous year. A total of RMB 22, 732.23 million was generated by mass maker spaces for the year, up 11.59% over the previous year. Approximately 149, 300 cubicles were offered, and RMB 3.222 billion in fiscal fund support was received. In terms of mass maker spaces' service statistics, the number of serviced entrepreneurial groups in the year was 221, 100, of which 218, 300 were startup companies.

In contrast, the number of startup companies that received investment and financing in the year amounted to 8, 529. the total investment and financing received by startup companies in the year were RMB 42, 622 million. As for the income statistics of mass maker spaces, service income totaled RMB 7, 623 million, rent and logistics income totaled RMB 7, 489 million, investment income totaled RMB 1, 593 million, and fiscal subsidy amounted to approximately RMB 3, 018 million (Torch High Technology Industry Development Center Ministry of Science & Technology, 2021).

3. PROBLEM STATEMENT

China's mass maker spaces have established a solid reputation for stimulating social innovation and promoting the development of the national economy since their conception. the double impact of the global economic downturn and COVID-19 has resulted in a broader range of problems since the explosion in mass maker spaces. Several manifestations of this transformation include the severe homogenization of development, the need for more late power, the lack of profitability, and the limited level of service. (Liu Qinliang, 2018). It has been the government's policy to promote the development of mass maker spaces in China. However, the problem of " surplus " has gradually surfaced, with homogenization, hollowing out, reliance on government subsidies, low social recognition, and insufficient entrepreneurial services becoming the main barriers to mass maker space development (Chen Wu, 2018, p. 74).

Many factors contribute to the above phenomenon, including over-reliance on government subsidies, insufficient targeted professional services, and a need for a professional management team. This study will scientifically analyze and evaluate the operational efficiency of the national mass maker spaces, which will play an essential role in optimizing the allocation of various innovation factors in maker spaces and achieving the orderly development of maker spaces. It will help improve the efficiency of the utilization of resources in maker spaces and provide a theoretical reference for the government to introduce specific support policies.

4. RESEARCH PROBLEM

National incentive policies have encouraged the development of mass maker spaces throughout the country, but at the same time, numerous problems have emerged. China is still in the exploration stage of mass maker space development. This has resulted in numerous serious problems, including poor service quality, low operational efficiency, poor performance, unreasonable resource allocation, and uneven development among regions, which impede mass maker spaces development in China.

In this way, it would be possible to evaluate the operational efficiency of maker spaces from both a theoretical and practical perspective. Proposals for optimization measures to enhance maker spaces' operational efficiency will contribute to maker spaces' development in China. As an instrumental part of the entrepreneurial ecosystem, mass maker spaces provide an additional impetus for the development of the regional economy. Consequently, a comparative study based on the operational efficiency of maker spaces in less developed and developed regions helps stimulate the vitality of the entrepreneurial ecosystem in less developed regions. the region's economy can then be injected with new blood. In particular, this study will identify the following research questions.

1. In-depth analysis of the overall operating efficiency of China's mass maker spaces and the differences in operating efficiency between regions.
2. Using a micro-analysis of the overall differences and the nature of the problems between the operational efficiency of mass maker spaces across Shandong and other eastern regions, an examination of the overall development differences is made.
3. To establish a theoretical system for the high-quality operation of mass maker spaces in Shandong Province, analyze the factors affecting the high-quality operation of mass maker spaces in Shandong Province, and provide references for promoting the transformation and upgrading of mass maker spaces in Shandong Province.

5. RESEARCH PURPOSES

The main objective of this study is to analyze the operational efficiency of mass maker spaces in Shandong and other eastern regions using data from the China Torch Statistical Yearbook as a sample for five years from 2019-2023 using the DEA method. Based on the analysis results, find out the reasons for the differences in the operation efficiency of mass maker spaces. Based on the analysis results, the study will identify the reasons for the differences in the operational efficiency of mass maker spaces. This study will take the national mass maker spaces in Shandong province as the research object, use the grounded theory to establish a theoretical system for the high-quality operation of maker spaces in Shandong province, and analyse the factors affecting the high-quality operation of

maker spaces in Shandong province. Lastly, countermeasures and suggestions for targeted operational efficiency improvement are provided based on the analysis results.

REFERENCE

[1] Liu, Q. L., & Xie, X. F. Study on Generation Mechanism of Mass-innovation Space under Theory of Innovation Ecosystem [J]. Science and Technology Management Research, 2018, 38(12):240–247.

[2] Chen, W., & Wang, Z. Z. Overview of Innovative Entrepreneurship Education: Connotation, Model, Problems and Solution Path [J]. Journal of Innovation and Entrepreneurship Education, 2019, 10(01):14–18.

[3] Zhang, Q. Deduction, Induction, Falsification and Big Data Method:Methodology of Scientific Research [J]. Gansu Geology, 2021, 30(04)A; 1–15.

[4] Burke, J., & Anthony, O. Mixed Methods Research: A Research Paradigm Whose Time Has Come [J]. Educational Researcher, 2004, 33(07):17.

[5] Yin, X. X. Research on Efficiency Evaluation of Provincial Maker Space Operation Based on DEA Method [D]. Jiangsu University of Science and Technology, 2019.

[6] Yang, Y. B. Research on Operating Efficiency and Business Model of Business Incubator. JiLin University, 2022.

[7] Liang, L. L. Research on Incubation Performance and Influence Factors of Information and Technology Business Incubators [D]. South China University of Technology, 2014.

[8] Wang, B. Study on Efficiency of High-tech Industry Innovation Activities which based on a New Internet DEA structure [D]. University of Science and Technology of China, 2014.

[9] Wei, W. Y. Makerspaces' Adaptive Mechanism under the Shock COVID-19 Pandemic: Evidence from Co-working Spaces of China. Published doctoral dissertation [D], University of Electronic Science and Technology of China, 2021.

[10] Li, Q. Q., & Wang, Z. Z. Overview of Innovative Entrepreneurship Education: Connotation, Model, Problems and Solution Path [J]. Journal of Innovation and Entrepreneurship Education, 2021, 10(01):14–18.

[11] Sun, G. Q., Yang, S., & Zhang, B. J. Has Technical Innovation Supported Hi-tech Entrepreneurship? -Provincial Measure Based on Entrepreneurial Ecosystem [J]. Forum on Science and Technology in China, 2021, (03):29–41.

[12] Zhang, N., & Cai, G. W. Study on the Bidirectional Governance Path of State-owned Capital Investment Operating Companies: Exploratory Analysis Using Grounded Theory Based on Governance Practices in Shanghai & Shenzhen [J]. Journal of Management World, 2021, 37(01):108–127.

Research on the Current Situation of the Living Integration of Intangible Cultural Heritage "Wuyin Opera" into Aesthetic Education Practice in Higher Vocational Colleges

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Abstract: Aesthetic education is an important way to cultivate college students' aesthetic ability and improve their aesthetic quality, and it is also an indispensable part of realizing their all-round development. Combining the action plan for aesthetic education infiltration in campuses proposed in the new era, this study organically integrates the local intangible cultural heritage "Wuyin Opera" with aesthetic education activities in higher vocational colleges, placing aesthetic education in a deeper and broader cultural context. By sorting out and excavating the current situation of the intangible cultural heritage "Wuyin Opera" and aesthetic education in higher vocational colleges, and combining the aesthetic value of "Wuyin Opera", this study injects new vitality into aesthetic education in higher vocational colleges, so as to further promote and inherit the excellent traditional Chinese culture in a living way.

Key Words: Intangible cultural heritage "Wuyin Opera"; Living integration; Aesthetic education in higher vocational colleges; Current situation; Value

1. INTRODUCTION

In May 2024, General Secretary Xi Jinping emphasized during his inspection of Shandong that "Shandong should shoulder the cultural mission of the new era and take active actions in promoting cultural prosperity, building a cultural power, and constructing a modern civilization of the Chinese nation. It is necessary to strengthen cultural confidence, deeply excavate the essence of excellent traditional Chinese culture, and adhere to creative transformation and innovative development. " In the new era, strengthening cultural confidence and promoting the construction of socialist culture with Chinese characteristics require giving full play to the characteristic advantages of regional culture, and the intangible cultural heritage around us is the best carrier. Wuyin Opera, a local drama in Shandong, features a simple and natural style with lyrics full of life flavor. It is a popular intangible cultural heritage inherited from generation to generation and widely spread in Zibo. As a representative of excellent regional culture, "Wuyin Opera" contains traditional virtue concepts such as "benevolence, righteousness, propriety, wisdom, and faith" in Confucian culture, as well as the spirit of craftsmanship in Qi culture, which is in the same vein as the craftsmanship spirit implied in modern vocational education concepts. However, with the development of the times and the diversification of entertainment, the development of Wuyin Opera has gradually declined, and its inheritance faces obstacles. Therefore, in the new era, Wuyin Opera urgently needs to play a role in a new living form. the combination of the intangible cultural heritage "Wuyin Opera" and aesthetic education in higher vocational colleges is an educational practice of far-reaching significance.

Based on this, combining the action plan for aesthetic education infiltration in campuses proposed in the new era, this study focuses on

sorting out the current situation and value of the organic integration of the local intangible cultural heritage "Wuyin Opera" and aesthetic education activities in higher vocational colleges, and strives to provide an operable practical plan for the living inheritance of intangible cultural heritage and the innovation of aesthetic education in vocational education, so that the cultural genes of Wuyin Opera can take root in higher vocational campuses and realize the multiple values of intangible cultural heritage protection, aesthetic education, and cultural innovation.

Research on the Current Situation of the Living Inheritance of Intangible Cultural Heritage "Wuyin Opera" and the Practice of Aesthetic Education Infiltration in Higher Vocational Colleges

2. RESEARCH ON THE CURRENT SITUATION OF THE "WUYIN OPERA"

2.1 Artistic Value and Cultural Connotation of "Wuyin Opera"

As one of the first batch of national intangible cultural heritages, Wuyin Opera carries profound artistic and cultural heritage. From an artistic perspective, its singing is gentle and unique, based on the musical structure of "five tones" (Gong, Shang, Jue, Zhi, Yu), and it pays attention to the natural conversion of true and false voices in singing skills, forming a delicate and layered auditory experience. For example, in the classic play Wang Xiao Drives a Donkey, the actors vividly demonstrate the emotional changes of the characters through unique singing, vividly reflecting the artistic charm of Wuyin Opera's singing. Wuyin Opera also reflects the craftsmanship spirit of striving for excellence in Qi culture. From script creation, singing polishing to stage performance, every link embodies the efforts of creators and performers. From the perspective of intangible cultural heritage studies, the characteristic of Wuyin Opera that closely combines artistic form and cultural value makes it an important sample for studying regional culture and traditional aesthetics.

2.2 Research on Inheritance Dilemmas

The inheritance of Wuyin Opera faces many severe challenges. According to the data from the Intangible Cultural Heritage Department of the Ministry of Culture and Tourism in 2024, there are only 7 inheritors nationwide, and the survey data from the Zibo Culture and Tourism Bureau shows that the young audience accounts for less than 12%, and the digitalization rate of plays is less than 5%. In terms of the inheritance model, it has long relied on the traditional method of oral and mental instruction. Although this model retains the original flavor of the art, it also has obvious disadvantages. Inheritors need to spend a lot of time and energy on one-on-one teaching, with a long training cycle and low efficiency, resulting in slow growth in the number of inheritors. At the audience level, the lack of interest in Wuyin Opera among young people is a major problem. With the diversification of modern entertainment methods, emerging cultural forms such as short videos and online games have attracted the attention of a large number of young people. the relatively traditional and slow-paced performance form of Wuyin Opera is difficult to meet their fast-paced life needs and aesthetic preferences. At the same time, the innovation of Wuyin Opera plays lags behind, and the content and expression form are out of touch with contemporary social life.

2.3 Existing Protection Measures

At present, certain progress has been made in the protection of Wuyin Opera. In 2006, Wuyin Opera was approved by the State Council of the People's Republic of China to be included in the first batch of national intangible cultural heritage lists. In order to better protect Wuyin Opera, Zibo established the only professional Wuyin Opera group in the country-Zibo Wuyin Opera Theater, aiming to inherit and develop this folk art form. Sun Tianli (2024) in Research on the Evolution and Protection of Wuyin Opera in Zibo from the Perspective of "Intangible Cultural Heritage" pointed out that Wuyin Opera is a popular intangible cultural heritage inherited from generation to generation and widely spread in Zibo. Wang Juan (2024) in Research on the Inheritance Practice of Wuyin Opera in Colleges and Universities pointed out that opera is an important carrier for inheriting excellent traditional Chinese culture, and the introduction of opera into campuses is the introduction of traditional culture into campuses and classrooms, which is the creative development and transformation of traditional culture.

3. CURRENT SITUATION OF AESTHETIC EDUCATION INFILTRATION PRACTICE IN HIGHER VOCATIONAL COLLEGES

3.1 Policy and Theoretical Basis

At the policy level, a series of policy documents such as the Opinions on Comprehensively Strengthening and Improving School Aesthetic Education in the New Era issued by the Ministry of Education provide clear guidance and policy support for higher vocational colleges to carry out aesthetic education. However, some colleges and universities simply equate aesthetic education with artistic skill training, paying too much attention to students' mastery of skills such as music and painting, while ignoring the cultivation of students' aesthetic concepts, cultural literacy, and emotional values. In terms of curriculum setting, aesthetic education courses often lack systematicness and depth, with outdated teaching content and single teaching methods, failing to truly achieve the goal of aesthetic education to "cultivate people through culture".

3.2 Practical Exploration

In terms of curriculum construction, enriching students' artistic knowledge. In terms of activity development, various art activities such as campus cultural and art festivals and art exhibitions have been held, providing a platform for students to display their artistic talents. At the same time, colleges and universities also pay attention to the construction of campus cultural space, creating a good aesthetic education atmosphere. However, these practical explorations still have many shortcomings. the curriculum system is fragmented, and there is a lack of organic connection and integration between different courses, failing to form a complete aesthetic education knowledge system.

3.3 Regional Advantages and Attempts

As the birthplace of Wuyin Opera, Zibo provides unique regional advantages for higher vocational colleges to carry out aesthetic education. Relying on this advantage, some higher vocational colleges have carried out activities such as "Wuyin Opera inheritors entering campuses" and "intangible cultural heritage play performances". In the activity of "Wuyin Opera inheritors entering campuses", inheritors enter classrooms and communities to teach students the performance skills and cultural knowledge of Wuyin Opera, stimulating students' interest in intangible cultural heritage. However, these attempts have not yet formed a complete aesthetic education system from curriculum setting, practical activities to evaluation feedback.

4. EXISTING PROBLEMS IN INTEGRATION PRACTICE

4.1 Insufficient Resource Integration

In the integration practice of intangible cultural heritage "Wuyin Opera" and aesthetic education in higher vocational colleges, insufficient resource integration is a prominent problem. From the perspective of artistic resources, the rich singing, scripts, performance forms, etc., of Wuyin Opera have not been fully excavated and integrated into aesthetic education courses. For example, in the existing music courses, the teaching and research of Wuyin Opera singing are rarely involved, and students cannot deeply understand the unique musical charm of Wuyin Opera. In terms of cultural connotation, the values such as traditional virtues and regional culture contained in Wuyin Opera have not been organically combined with the teaching content of aesthetic education, resulting in students' understanding of Wuyin Opera culture staying on the surface. In addition, the lack of a systematic teaching resource library and professional teaching team is also an important manifestation of insufficient resource integration. At the same time, there is a shortage of professional teachers in higher vocational colleges who understand both Wuyin Opera culture and have aesthetic education teaching capabilities. Teachers are difficult to carry out in-depth explanations and teaching guidance on Wuyin Opera in the teaching process, affecting the effect of integration practice.

4.2 Single Practice Mode

The existing integration practice mode of intangible cultural heritage and aesthetic education is relatively single, mostly staying at shallow-level activities such as performances and lectures. In Wuyin Opera performance activities, students only passively watch as audiences and cannot personally participate in the performance and

creation process, making it difficult to truly experience the artistic charm and cultural connotation of Wuyin Opera. the lack of in-depth interaction leads to limited student participation. In the fast-paced modern society, students are more inclined to participate in activities with fun, interactivity, and experience. However, the existing single practice mode cannot meet the needs of students, making it difficult for students to maintain interest in Wuyin Opera and form a deep emotion and cultural identity with intangible cultural heritage.

4.3 Lack of Evaluation Mechanism

At present, a scientific evaluation index system for the integration effect of intangible cultural heritage and aesthetic education has not been established. In traditional aesthetic education evaluation, the focus is mainly on students' mastery of artistic skills and course grades, while there are no effective means to evaluate students' cognitive understanding of intangible cultural heritage, improvement of aesthetic literacy, and cultivation of cultural identity. the lack of an evaluation mechanism makes it difficult for schools to understand the actual effect of the integration practice of intangible cultural heritage and aesthetic education, and it is impossible to timely discover problems in the teaching process and make improvements. At the same time, it is also impossible to provide students with comprehensive and objective learning feedback, which is not conducive to stimulating students' enthusiasm for participating in intangible cultural heritage learning and aesthetic education practice, and restricts the in-depth development of the integration of intangible cultural heritage and aesthetic education.

REFERENCES

[1] Xi Jinping: "Xi Jinping stressed during his visit to Shandong that further comprehensive reform should be the driving force to strive to write a new chapter of Chinese-style modernization in Shandong" [D]. Xinhua News Agency, May 24, 2024.

[2] Sun Tianli: Research on the Transformation and Protection of Wuyin Opera in Zibo Region from the Perspective of Intangible Cultural Heritage [J]. New Legend, May 23, 2024.

Discussion on Common Problems and Countermeasures in Badminton Teaching in Colleges and Universities

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Abstract: As an important component of physical education teaching, badminton courses in universities not only carry the task of enhancing students' physical fitness, but also play a key role in cultivating students' interests, hobbies, and lifelong sports awareness. However, in current teaching practice, there are still problems such as insufficient professional competence of teachers, unscientific curriculum content, and low student participation enthusiasm, which affect the quality of teaching and the effectiveness of education. This article analyzes common problems in current badminton teaching in universities, and proposes targeted optimization strategies based on specific cases, aiming to improve the effectiveness of the curriculum and student participation experience, and provide reference for the reform of physical education teaching in universities.

Keywords: College Sports, Badminton Teaching, Teaching Issues, Curriculum Reform, Teaching Strategies

1. INTRODUCTION

University badminton courses combine competitiveness and fun, and have positive value in improving students' physical fitness, teamwork ability, and sports skills. However, in the teaching process, problems such as incomplete curriculum system, single training methods, and lack of evaluation mechanisms often arise, making it difficult for the curriculum to perform its intended function. This article is based on the current situation, starting from the problems, analyzing the causes, and exploring countermeasures, in order to promote the systematization, scientificity, and diversification of badminton teaching.

2. MAIN PROBLEMS IN BADMINTON TEACHING IN UNIVERSITIES

2.1 Lack of specialized guarantee for teachers' professional competence

University badminton courses are generally undertaken by general physical education teachers, most of whom come from comprehensive sports professional backgrounds and lack systematic badminton specific training experience. During a teaching quality supervision conducted by the physical education department of a certain school, it was found that among the six teachers who participated in badminton courses, only one had the intermediate coaching qualification issued by the Chinese Badminton Association, and the rest of the teachers did not receive specialized technical training. the design of courseware and classroom organization rely on personal experience, and there are problems such as unclear textbook structure, repetitive training content, and chaotic teaching pace. Due to incomplete technical mastery, some teachers are unable to provide students with error correction guidance, resulting in significant deviations during the action shaping stage, which affects learning effectiveness.

2.2 The course content structure is single and lacks hierarchy

The teaching content mainly focuses on basic exercises such as serving, high and far shots, and net picks, neglecting the cultivation of comprehensive abilities such as tactical application, on-site judgment, and practical response. Students experience fatigue after receiving the same content training for multiple consecutive semesters. the satisfaction survey results of a physical education course in a certain college show that students have a low rating for the

"repetitiveness" of badminton course content, with many feedbacks mentioning "similar content in each class" and "no competitive atmosphere". the curriculum lacks hierarchical design and fails to establish advanced content for students of different levels, resulting in students with strong technical foundations feeling slow learning progress, while students with weak technical skills lose confidence due to not being able to keep up with the pace.

2.3 Insufficient motivation for student participation and low classroom effectiveness

Under the elective system, badminton courses have become an alternative choice for some students to avoid high-intensity activities such as running and swimming, lacking genuine interest in sports. On the teaching site, it is common for students to have passive cooperation and perfunctory movements, and some students even frequently take excuses to ask for leave or skip classes without reason. A certain school uses the teaching assistance system "Sports Star" to track students' attendance and participation. the data shows that more than one-third of the students' class center rate has not reached the effective exercise range, indicating insufficient exercise intensity. In the classroom, students lack goal awareness and motivation for self-improvement, and behaviors such as "playing with mobile phones" and "standing still" are frequently recorded in teaching evaluations. Teachers find it difficult to mobilize the classroom atmosphere, resulting in a situation where "teachers work hard to teach while students learn passively". the interweaving of teacher qualifications, curriculum design, and student engagement has led to inefficient operation of badminton teaching in universities, and there is an urgent need for systematic improvement strategies to reshape teaching quality and student experience.

3. COUNTERMEASURES AND PATHS FOR OPTIMIZING BADMINTON TEACHING IN UNIVERSITIES

3.1 Strengthening the professionalization of the teaching staff

Improving the quality of badminton courses in universities relies on the support of professional teaching staff. A certain university has introduced badminton coaches as course advisors and organized physical education teachers to participate in coach level certification training organized by the China Badminton Association. the school conducts open course evaluations through the "teaching mutual evaluation" system, with specialized teachers paired with young teachers to provide technical guidance and jointly build teaching designs. To enrich teaching resources, teachers record standard action videos and upload them through the "Zhiti" platform for students to watch and learn repeatedly, improving the accuracy of action understanding and execution. After improving their specialized abilities, teachers are able to provide personalized explanations and technical corrections for students' incorrect movements, resulting in a significant improvement in teaching quality.

3.2 Enrich teaching content and focus on hierarchical guidance

The course design incorporates practical exercises such as tactical drills, group confrontations, and mixed doubles, guiding students to master coordination strategies and adaptability on the field in real-life situations. A certain school divides badminton courses into basic and advanced classes, and students voluntarily choose based on their admission test scores. the teaching content and objectives are differentiated. the basic class focuses on movement standards and repetitive exercises, while the improvement class focuses on advanced content such as attack and defense rhythm and landing point control. Teachers use the "Wing Sports Badminton" software to develop personalized training plans for students, dynamically adjusting the difficulty based on classroom performance, and enhancing the pertinence of learning. Through a gradual teaching arrangement, stimulate students' willingness to actively participate and continuously improve.

3.3 Building a diversified incentive and scientific evaluation mechanism

The teaching evaluation system integrates skill testing, practical performance, learning attitude, and team collaboration performance, weakening the traditional exam oriented evaluation tendency. the classroom implements a "points system" management, where students can accumulate points by participating in competitions and completing

skill tasks. Those who meet the point standards can redeem the school's sports honor title or course bonus points. A certain university sports center has designed an "intelligent badminton classroom" platform, where teachers can input student performance data in real time, generate individual skill growth maps, and push them to the student end. the evaluation results are not only used for grade assessment, but also serve as the basis for students' independent review. Clear goals and visual feedback have enhanced students' motivation to participate, promoting the development of classroom teaching towards standardization and sustainability. Optimizing the path requires the collaborative promotion of teachers, curriculum, and evaluation systems, strengthening teaching execution and student subjectivity, and fundamentally enhancing the teaching effectiveness and educational value of badminton courses.

4. CONCLUSION

University badminton teaching has unique advantages in the dual value of physical education and education, and is an important pivot to promote the diversified development of the university sports curriculum system. the current problems in the teaching process, such as insufficient professional competence of teachers, single teaching content setting, and insufficient student participation motivation, have become key obstacles to improving classroom quality. In teaching practice, badminton courses often suffer from weak professional support, lack of innovation in design, and lagging evaluation models, resulting in low efficiency in students' technical acquisition, insufficient classroom vitality, and difficulty in achieving teaching objectives. To address the above issues, universities need to establish a systematic teaching optimization mechanism, and reconstruct it from three aspects: faculty construction, curriculum structure, and teaching evaluation. In terms of the teaching staff, we should promote the training and introduction of specialized teachers, forming a virtuous cycle of "training certification teaching research co construction". In terms of course content, the "action training assessment scoring" model should be broken, and diversified content such as tactical application, project-based tasks, and practical exercises should be introduced to achieve the unity of teaching interest and practicality. In terms of teaching evaluation, mechanisms such as point system, visual growth feedback, and process recording should be established to enable students to internalize and transform their learning motivation in clear goals. the essence of badminton teaching is not only technical instruction, but also a platform for shaping sportsmanship, teamwork, and lifelong exercise awareness. Universities should be guided by specialization, refinement, and humanistic values to create an attractive, challenging, and growth oriented curriculum system, providing students with high-quality and in-depth physical education learning experiences. Through system optimization, badminton teaching in universities will better serve the sports education strategy and provide strong practical support for the connotative development of higher education in the new era.

REFERENCES

[1] Liu Jianhua Research on the Problems and Reform Countermeasures of Badminton Teaching in Colleges and Universities [J]. Sports Science and Technology Literature Bulletin, 2023, 31(06):52-54

[2] Wang Zhiqiang Optimization of teaching content and organizational strategies in badminton courses [J]. Modernization of Education, 2022, 9(10):141-143

[3] Li Xue Research on Strategies for Enhancing Student Participation in College Physical Education Classrooms: A Case Study of Badminton Teaching [J]. Contemporary Sports Technology, 2021, 11(36):87-89

[4] Zhao Qian Reform of Badminton Course Teaching and Innovation of Evaluation Mechanism in Colleges and Universities [J]. Youth Sports, 2023(03):103-105

The Practical path and Value Reconstruction of the Role of College Counselors in the Era of Artificial Intelligence

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Abstract: Against the backdrop of the deep integration of artificial intelligence technology into higher education, college counselors, as a key force in fulfilling the fundamental task of fostering virtue and nurturing talent, are confronted with the dual challenges of role transformation and capability upgrading. the aim is to provide a theoretical reference and action framework for building a new ecosystem of "intelligence+ ideological and political education".
Keywords: Artificial intelligence; College counselor; Moral education; Role transformation; Nurturing system

1. INTRODUCTION

In the strategic process of building a strong education nation in an all-round way, artificial intelligence technology is reshaping the educational model, management paradigm and value system of higher education with disruptive power. College counselors, as mentors for students' growth and development and close friends for a healthy life, shoulder the sacred mission of "cultivating people for the Party and talents for the country". In the double variation of technology empowerment and value commitment, how to give full play to the technological advantages of artificial intelligence to enhance the effectiveness of education while always adhering to the humanistic essence of education to ensure the direction of education has become an important proposition for ideological and political work in colleges and universities in the new era.

2. POLITICAL GUIDANCE: ANCHOR THE DIRECTION OF EDUCATION IN THE ERA OF ARTIFICIAL INTELLIGENCE

2.1 The political nature of education and the mission and responsibility of counselors

Education is a major national and party undertaking, and its essential nature is political. College counselors, as the backbone force in conducting ideological and political education for college students, must always adhere to the fundamental direction of "cultivating people for the Party and talents for the country" and incorporate ideological and political education throughout the entire process of student work. Although artificial intelligence technology can improve the efficiency and precision of educational management, its application must serve the core goals of ideological and political education and must not deviate from the fundamental questions of "what kind of people to cultivate, how to cultivate them, and for whom to cultivate them".

2.2 Preventing ideological risks and strengthening the awareness of digital sovereignty

In the era of artificial intelligence, cyberspace has become the main battlefield of ideological struggles, and the risk of Western hostile forces infiltrating ideas and cultures by taking advantage of technological superiority has increased. College counselors must strengthen their awareness of "digital sovereignty" and embed "political filters" in the construction of intelligent platforms and the application of technology to ensure that algorithmic logic is in line with the Party's educational policy and resonates with the core socialist values. We should strictly review the data sources, algorithmic models and output results of the intelligent system to prevent the spread of bad information and the infiltration of wrong values, and firmly grasp the leadership,

management and discourse power of ideological work.

At the same time, counselors should be well aware that technology is a double-edged sword. They should not only make full use of the technological advantages of artificial intelligence to enhance the effectiveness of education, but also be vigilant against the alienation of the essence of education by technological rationality.

III. Technology empowerment: Reconstructing the methodological system for counselors' work

2.3 Paradigm shift from experience-based management to data governance

The traditional student management in colleges and universities mainly relies on the personal experience and subjective judgment of counselors, and there are problems such as insufficient accuracy and low efficiency. the deep application of artificial intelligence technology is driving a paradigm shift in counselors' work from "experience-based management" to "data governance". By building a dynamic profile system for students' growth, integrating multi-dimensional data such as students' academic performance, mental state, behavioral trajectory, and social practice, and using technologies such as big data analysis and machine learning, precise identification, analysis, and intervention for students' growth and development can be achieved.

2.3 Three core practice scenarios empowered by technology

1Precise ideological and political education: Building a mental health early warning and intervention system. Precision ideological and political education is an important application scenario of artificial intelligence technology in the field of ideological and political education. By using AI technology to analyze students' emotional data, behavioral data, social data, etc., identify students' emotional fluctuations and psychological problems, and build mental health early warning models. For example, using natural language processing technology to analyze students' remarks on social media, online forums, etc., to identify negative emotions and psychological crisis signals; Monitor students' physical indicators, such as heart rate and sleep quality, through smart wearable devices to assess their mental state.

Smart management: Enhance the fairness and efficiency of educational management. Intelligent management is the specific application of artificial intelligence technology in student management, aiming to achieve the automation, standardization and transparency of management processes through technological means to enhance management efficiency and fairness. For example, AI technology is used to automate the entire process of scholarship and financial aid review. By setting clear review indicators and algorithm models, a comprehensive assessment of students' family economic status, academic performance, social practice and other data is conducted to automatically generate review results, avoiding human interference and ensuring the fairness and impartiality of the review process.

2.4 The value orientation of technology empowerment: Focus on the core function of value guidance

The ultimate goal of technology empowerment is not to replace the work of counselors, but to free them from the cumbersome transactional work, allowing them to devote more time and energy to the core function of value guidance. By automating and intelligentizing student management through artificial intelligence technology, counselors will have more opportunities to interact face-to-face with students, gain a deeper understanding of their thoughts and inner needs, and carry out targeted ideological and political education and value guidance. For example, in communication with students, counselors can combine the "intelligent profile" of students to conduct in-depth analysis of students' ideological problems and behavioral motivations, and guide students to establish correct worldviews, outlooks on life and values.

3. HUMANISTIC COMMITMENT: LAYING A SOLID FOUNDATION FOR EDUCATION IN THE TECHNOLOGICAL AGE

3.1 The dialectical relationship between technological rationality and humanistic care

The development of artificial intelligence technology has brought about the efficiency and precision of educational management, but it may also lead to the instrumentialization and coldness of education. There is an inherent

tension between technological rationality, which emphasizes efficiency, precision and standardization, and humanistic care, which focuses on emotion, experience and personalization. As educators, college counselors must properly handle the relationship between technological rationality and humanistic care, making full use of the advantages of technology while always adhering to the humanistic nature of education and paying attention to the emotional needs and spiritual growth of students.

3.2 Build a new working paradigm of human-machine collaboration

In order to achieve a balance between technological rationality and humanistic care, college counselors need to build a new working paradigm of "human-machine collaboration". On the one hand, we need to give full play to the advantages of artificial intelligence technology to improve work efficiency and accuracy. For example, use AI chatbots to provide 24-hour online counseling services for students and promptly answer their questions regarding studies, life, psychology, etc. Monitor students' thoughts in real time through an intelligent analysis system to warn of potential problems and risks in advance.

On the other hand, it is necessary to enhance the humanistic care ability of counselors and improve the quality and effectiveness of face-to-face communication with students. Counselors should enhance their "digital literacy", be proficient in the application methods and operation processes of artificial intelligence technology, and be able to work within a data-driven decision-making framework. At the same time, it is necessary to go deep within the students, understand their real needs and thinking trends, break down the barriers between technology and emotion, and improve empathy, ethical judgment and complex problem-solving skills. For example, based on the analysis of student data using AI technology, counselors should conduct in-depth interviews and research in combination with the actual situation of students, formulate personalized education plans, and achieve the organic unity of technological tools and humanistic care.

3.3 Adhere to the essence of education: Value choices that transcend the alienation of technology

In the era of artificial intelligence, preventing technological alienation has become an important issue in the field of education. Technology alienation is manifested in the control and domination of people by technology, making people slaves to technology. College counselors should adhere to the essence of education, always take the all-round development of students as the starting point and end point of their work, and avoid falling into the trap of technology supremacy. It should be recognized that artificial intelligence technology is only a tool and means of education, and its value lies in serving the realization of educational goals rather than replacing education itself.

4. CAPACITY LEAP: BUILDING THE CORE COMPETENCE OF COUNSELORS IN THE NEW ERA

4.1 New requirements for the ability structure of counselors in the Age of Artificial intelligence

The advent of the AI era has put forward new and higher requirements for the ability structure of college counselors. In addition to the traditional abilities such as ideological and political education, organization and management, and communication and coordination, the following three new qualities need to be focused on:

Data literacy: the key ability to understand the growth patterns of students. Data literacy refers to the ability of a counselor to use big data analysis tools and methods to collect, organize, analyze and apply students' data. Through the improvement of data literacy, counselors can gain insights into students' growth patterns, hobbies, potential needs, etc. from the vast amount of student data, providing a scientific basis for precise education. By analyzing students' course selection data, reading data, social data, etc., we can understand their knowledge structure and cognitive characteristics and recommend personalized learning resources and development paths for them.

Technical application ability: A necessary skill for mastering intelligent tools. Technical application skills refer to the ability of counselors to operate intelligent management platforms and participate in the development of educational products. With the widespread application of artificial

intelligence technology in student affairs in colleges and universities, counselors need to master the use of intelligent management platforms such as student information management systems, mental health monitoring systems, employment guidance service systems, etc., and be able to propose optimization suggestions and development requirements for intelligent systems based on actual work needs. At the same time, counselors are encouraged to participate in the development of educational products, such as designing mini-programs and online courses for ideological and political education based on AI technology, to enhance the interest and effectiveness of education and teaching.

4.2 Paths and strategies for enhancing the capabilities of counselors

Strengthen professional training: Build a multi-level capacity building system. Colleges and universities should build a multi-level and all-round training system for counselors, providing them with systematic training in artificial intelligence technology and ethics education. Experts and scholars in the field of artificial intelligence and educational technology workers can be invited to give lectures to help counselors understand the basic principles, development trends and application cases of artificial intelligence in education through special lectures, workshops and online courses. At the same time, ethics training for counselors should be strengthened to guide them in establishing correct technical values and enhancing their sense of ethical responsibility.

Promote practical innovation: Enhance the ability to apply technology in work. Practice is the best way to improve skills. Colleges and universities should encourage counselors to actively participate in the practical exploration of artificial intelligence technology in student work and support counselors to carry out innovative projects of "intelligence+ideological and political education". For example, organize counselors to conduct research on innovative models of ideological and political education based on AI technology, and explore the use of technologies such as virtual reality (VR) and augmented reality (AR) for immersive ideological and political education; Encourage counselors to use big data analysis methods to conduct research on students' ideological trends and write related research papers and investigation reports. Through practical innovation, counselors can accumulate technical application experience in their actual work and improve their ability to solve practical problems.

REFERENCES

[1] Speech at the National Education Conference [N]. People's Daily, 2018-09-11(01).

[2] Opinions of the Ministry of Education on Strengthening the Construction of the Counselor Team in Colleges and Universities [Z]. Jiao Si Zheng [2005] No. 2.

[3] Kai-Fu Lee. Artificial Intelligence Era [M]. Beijing: CITIC Press, 2018.

[4] Feng Gang. Research on the Innovative Development of Ideological and Political Work in Colleges and Universities in the New Era [M]. Beijing: People's Publishing House, 2019.

[5] Chen Xiaoming. Innovative Approaches to Student management in colleges and universities in the Era of Big Data [J]. College Theory Front, 2017(05):58-61.

[6] Wang Ying. Research on the Application of Artificial Intelligence in Ideological and Political Education in colleges [J]. Journal of Ideological and Theoretical Education, 2020(03):135-139.

Research on the Practical Difficulties and Mechanism Innovation of the "Three-pronged Education" Model in Ideological and Political Education in Colleges and Universities"

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Abstract: In the context of the new era, ideological and political education in universities, as a key lever for implementing the fundamental task of cultivating morality and talents, has become a core issue in improving the effectiveness of education through innovative models. This article focuses on the practical exploration of the concept of "three pronged education" and deeply analyzes the multidimensional difficulties currently faced by universities. Propose targeted measures to break down departmental barriers and establish a responsibility system centered around party and government leadership; Building a collaborative platform for education, promoting the optimization and integration of curriculum, practice, and information resources; Establish an evaluation system for "comprehensive education" and strengthen the process evaluation and feedback loop. Through systematic mechanism optimization, we aim to promote the development of the "three pronged education" towards a more dynamic and sustainable direction, providing institutional guarantees and practical guidance for achieving the fundamental goal of cultivating morality and talents.

Keywords: Ideological and Political Education in Universities; Three Pronged Education; Mechanism Innovation; Resource Integration

1. INTRODUCTIONS

In the current era of globalization and informatization, the diversified collision of values and the continuous infiltration of Western cultural trends have had a profound impact on the ideological concepts and value orientations of college students. At the same time, China's higher education is shouldering the historical mission of cultivating builders and successors who shoulder the heavy responsibilities of the times for the prosperity and national rejuvenation of the country. How to effectively respond to the practical challenges of "insufficient effectiveness", "low cohesion" and "lack of sense of the times" in ideological and political education has become a major theoretical proposition and practical issue that ideological and political workers and researchers in universities must face.

2. THE CORE VALUE AND PRACTICAL CHALLENGES OF "THREE PRONGED EDUCATION" IN IDEOLOGICAL AND POLITICAL EDUCATION IN UNIVERSITIES

2.1 theoretical Implications And Requirements Of the Era Of "Three Pronged Education"

The concept of "three pronged education", namely educating all members, educating throughout the entire process, and educating in all aspects", is the essence of China's ideological and political education in the new era, which has been refined based on the long-term practical experience of ideological and political education in universities. the core spirit lies in breaking down the problems of blurred responsibility boundaries, fragmented links, and fragmented space that commonly

exist in the traditional education process, and building a three-dimensional ideological and political education network system that is continuous in time, covered in space, diverse in subjects, and coordinated in progress.

Specifically, the "all staff education" aims to activate all educational potential both inside and outside the university. It explicitly requires every faculty member to have a sense of educational subjectivity, professional teachers should not be satisfied with simply imparting knowledge, management personnel should reflect educational orientation in daily services, and logistics staff can also use their work as a carrier to convey values. At the same time, the support and influence of families, the positive resources of society, and the exemplary effect of outstanding alumni should be fully incorporated into this system. [1]

The concept of 'whole process education' emphasizes the integration of ideological and political education throughout students' entire learning journey from enrollment to graduation, reflected in every course, experiment, and internship. the core elements of ideological and political education should be like an invisible red rope that runs through the entire process, rather than being limited to specific classrooms or time periods. This concept requires universities to examine ideological and political education at all stages with systematic thinking, ensuring that students receive targeted value guidance at critical life stages. ''

'Comprehensive Education' focuses on the multidimensional expansion of educational space, breaking through the physical limitations of the 'first classroom' and extending the education platform to various fields such as campus life, social practice, and cyberspace. It requires universities to integrate ideological and political education into "curriculum teaching, scientific research, social practice, cultural construction, online communication, mental health education, management services, " and other aspects, striving to achieve an overall atmosphere of "education everywhere and education at all times, " forming a three-dimensional immersive education pattern.

2.2 Deep Challenges Faced By the Practice Of "Three Pronged Education"

Looking at the current practice of ideological and political education in universities, although the concept of "three pronged education" has been widely recognized, it still faces many structural difficulties in the specific implementation process:

2.2.1 insufficient collaboration among educational subjects and unclear boundaries of rights and responsibilities

The internal organizational structure of universities is often divided based on majors or functional departments, which leads to serious "responsibility dispersion" in the process of educating students. For example, many full-time teachers believe that ideological guidance is the responsibility of ideological and political education teachers or counselors, and therefore only focus on knowledge transmission in professional teaching, failing to fully explore the value elements contained in the curriculum; Although administrative personnel or logistics service personnel have direct contact with student life, they generally lack the awareness guidance and skill training to actively educate students; Although counselors and homeroom teachers are highly close to the student population, they are limited by complex administrative work and find it difficult to provide systematic and in-depth guidance on students' ideological dynamics.

2.2.2 insufficient dispersion and aggregation of resources, urgent need to explore the value of education

There are abundant educational resources within universities, but their role has not been fully utilized in reality: the ideological and political elements in professional course teaching are often not activated due to a lack of systematic sorting; Although various campus activities are frequently carried out, they have not established a deep connection with ideological and political education; the educational value of social practice or volunteer service often has not been deeply expanded. the interaction between various educational carriers is insufficient, often in a state of "isolated islands" where they are fighting on their own - curriculum education, scientific research education, practical education, etc. have not formed an organic collaborative ecosystem.

2.2.3 insufficient supply of institutional construction, urgent need to improve

evaluation mechanism

Effective institutional support is an important guarantee for establishing a long-term mechanism for educating people. the survey shows that although most universities actively promote the "three pronged education", the relevant incentive and guarantee mechanisms are generally lagging behind. the prominent manifestation is the lack of a scientific evaluation mechanism for the educational contributions of non dedicated ideological and political teachers; the boundary of rights and responsibilities for personnel in various positions to participate in education work is not clear; the system design for collaborative promotion among various departments is incomplete. Especially at the evaluation level, the traditional evaluation index system mainly focuses on teachers' research output and teaching hours, and the evaluation of their ideological value guidance and collaborative effectiveness in educating students is clearly insufficient. When the education work cannot be fully reflected in the evaluation system, the motivation for teachers and management service personnel to participate will inevitably be greatly weakened. [2]

3. SYSTEMATIZED PATH FOR INNOVATING THE "THREE PRONGED EDUCATION" MECHANISM IN HIGHER EDUCATION INSTITUTIONS

Faced with structural difficulties in current practice, universities urgently need to shift from deepening conceptual understanding to optimizing institutional mechanisms, and build a more systematic, coordinated, and sustainable "three in one education" operational framework.

3.1 Consolidate Consensus On Collaborative Education And Establish a Responsibility Operation Mechanism With Clear Rights And Responsibilities

The primary task in eliminating collaborative barriers in the "three pronged education" is to establish a clear system architecture of rights and responsibilities: firstly, to establish a physical "three pronged education work committee" at the school level; Secondly, at the departmental level, establish a normalized joint meeting system to unify the planning and deployment of the unit's educational tasks; the third is to develop a list of responsibilities covering various positions, clearly defining the specific responsibility boundaries and work norms of different roles such as full-time teachers, counselors, management personnel, and service personnel in the "three pronged education", and clarifying the requirements and scope of their educational responsibilities. Tianjin University has innovatively launched the "Curriculum Ideological and Political Responsibility Professor System" in the implementation of the "Three pronged Education" work, in which professors are responsible for the development of ideological and political resources and the demonstration of education, forming a vertically connected and horizontally coordinated responsibility chain, greatly improving the level of educational synergy.

3.2 Building a Collaborative Platform For Education And Establishing a Mechanism For Integrating And Transforming Diverse Resources

The deep integration of educational resources is a key driving force for improving educational effectiveness. Firstly, efforts should be made to create an open and shared "resource integration platform", such as building a school level "ideological and political education resource library", gathering high-quality ideological and political resources both inside and outside the school, and achieving cross departmental sharing; Secondly, carefully design a "multidimensional linkage education project" that systematically integrates multiple educational carriers such as classroom teaching, scientific research training, social practice, campus culture, and online ideological and political education, forming a collaborative resonance effect. Thirdly, make good use of modern technological means to enhance the efficiency of utilizing educational resources, build a "smart ideological and political platform", and use big data technology to conduct portrait analysis of student growth data to accurately match the delivery points of educational resources.

3.3 Establish An Incentive Guarantee Mechanism Guided By Evaluation

A scientific and long-term guarantee mechanism is an important foundation for maintaining the vitality of the "three pronged education". On the one hand, universities should establish an evaluation index system

that highlights the contribution of "three pronged education". In the promotion of teacher professional titles, job appointments, and evaluation, core indicators such as participation in curriculum ideological and political construction, guidance for students' ideological growth, and collaborative education effectiveness should be systematically included. In particular, the weight of educational achievements in promotion standards should be increased. On the other hand, establish a process oriented supervision and feedback mechanism: include the collaboration of various departments in carrying out educational work as an important observation point in the annual assessment; Regularly evaluate the effectiveness of educational projects and dynamically adjust and optimize them based on feedback; Special honor rewards and performance preferences will be given to collectives and individuals who have demonstrated outstanding performance in the process of education. [3]

4. CONCLUSIONS

As a key path for the reform of ideological and political education models in universities in the new era, the core of "three pronged education" lies in the systematic integration of educational subjects, optimization of integrated educational resources, scientific establishment of evaluation systems, and ultimately the formation of an organic collaborative and internally driven ecological mechanism for education. To solve the difficulties of dispersed responsibilities, fragmented resources, and insufficient incentives in implementation, university managers need to promote top-level design and institutional innovation with systematic thinking: clarify the educational responsibilities of various positions on campus, build a resource integration and sharing platform, and establish an evaluation and feedback system with educational effectiveness as the core. In the future, the mechanism construction of "three pronged education" still needs to focus on the development trend of educational digitization, explore new paths for artificial intelligence to assist personalized ideological and political education, and further deepen the integration mechanism design of the five pronged education, building a more open and collaborative modern university education system architecture.

REFERENCES

[1] Wang Xuejian, Shi Yan the connotation, concept, dilemma and countermeasures of ideological and political education in the new era curriculum [J]. Teaching and Research, 2019(07):10-17.

[2] Shen Zhuanghai Exploring the Effectiveness of Ideological and Political Education [J]. Social Sciences in Chinese Universities, 2020(03):15-22.

[3] the General Office of the Communist Party of China Central Committee and the General Office of the State Council Overall Plan for Deepening the Reform of Educational Evaluation in the New Era [Z]. 2020.

Exploring the Path of Innovation and Entrepreneurship Education in Higher Education Institutions Under the Perspective of New Quality Productivity

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Abstract: With the development of new quality productivity, universities are facing a series of practical difficulties in innovation and entrepreneurship education, such as the difficulty of balancing theory and practice, the difficulty of integrating the first and second classrooms, and the difficulty of deep integration between universities and enterprises. Universities can promote the high-quality development of innovation and entrepreneurship education through measures such as integrating theory and practice, breaking down classroom barriers, and deepening school enterprise cooperation.

Keywords: New Quality Productivity; Innovation and Entrepreneurship Education; Route

1. THE CONNOTATION AND CHARACTERISTICS OF NEW QUALITY PRODUCTIVITY

General Secretary Xi Jinping emphasized during the 11th collective study session of the Political Bureau of the Communist Party of China Central Committee that developing new quality productive forces is an inherent requirement and important focus for promoting high-quality development. New quality productivity takes innovation as the primary driving force, strategic emerging industries and future industries as the main carriers, and high-level dynamic balance between new supply and new demand as the foothold. It breaks away from traditional economic growth methods and traditional productivity development paths, and has the characteristics of high technology, high efficiency, and high quality. It is an advanced productivity quality that conforms to the new development concept. the basic connotation of new quality productivity mainly includes the leap of laborers, labor materials, labor objects, and their optimized combinations. [1]

2 THE RESPONSIBILITY AND MISSION OF UNIVERSITIES FROM THE PERSPECTIVE OF NEW QUALITY PRODUCTIVITY

Within the virtuous cycle linking education, technology, and talent advancement, developing new quality productive forces requires universities—as the primary battleground for talent cultivation—to systematically dismantle constraining bottlenecks. Key roadblocks include misaligned curricula failing to deliver cross-disciplinary competencies, inadequate industry-academia R&D coordination slowing technology commercialization, and rigid evaluation systems overlooking innovation capabilities. As new-quality talents determine the genesis of new-quality productivity, institutions must pioneer three transformations: building future-oriented programs fusing AI/Green Tech with critical thinking, creating industry-embedded laboratories accelerating breakthrough translation, and establishing talent development models where 80% of graduates achieve certified innovation proficiency. Only through resolving these structural impediments can higher education fulfill its core mission: sculpting agile innovators capable of turning scientific discovery into sustainable productive gains.

2.1 universities need to cultivate innovative talents for technological development

The report of the 20th National Congress of the Communist Party of China emphasizes that innovation and entrepreneurship education, as an important component of educational modernization, is related to the quality of talent cultivation and national development. the cultivation of innovative talents requires universities to use flexible and diverse teaching methods, design open curriculum questions, uphold a scientific and rigorous academic atmosphere, create an inclusive cultural atmosphere, and through the interaction of implicit and explicit cultures, subtly influence students and stimulate their innovation and entrepreneurship potential. Although lecture based and indoctrination based teaching can quickly acquire knowledge in a short period of time, they overlook students' interest and willingness to learn, which can easily bury their innovative potential. Colleges and universities should carry out management revolution according to the characteristics of the school and students, and create a relaxed atmosphere suitable for students' individual development.

2.2 universities need to adjust their relationship with various aspects of economic and social development

As a cradle for nurturing talents and a bridge connecting talents with social needs, the status of universities is self-evident. the transition from imparting mature knowledge to adapting talents to new ways of knowledge growth and possessing innovative and entrepreneurial abilities is undoubtedly a manifestation of the responsibility and commitment of universities. In addition, in terms of “academic research”, universities are an important force in cultivating talents as the primary resource and generating innovation as the primary driving force. If the endogenous driving force is insufficient, not only will there be a disconnect between industry, academia, and research, but it will also affect the implementation of China's strategy of building a strong country. Universities should cooperate with society to discover, analyze, and solve problems in social development, and effectively cultivate students' innovation and entrepreneurship abilities. They should cooperate with enterprises to timely understand the development trend of cutting-edge technology fields. They should attach importance to the status and function of applied scientific research, and produce high conversion rate results based on reality.

3 CURRENT CHALLENGES IN INNOVATION AND ENTREPRENEURSHIP EDUCATION IN HIGHER EDUCATION INSTITUTIONS

3.1 difficulty in balancing theory and practice

In terms of the composition of teaching staff, counselors are responsible for teaching innovation and entrepreneurship education courses in many universities, but due to the lack of practical experience in entrepreneurship, the teaching effectiveness is greatly reduced. In order to stimulate students' entrepreneurial enthusiasm, some universities hire some entrepreneurs with successful entrepreneurial experience from outside the school to hold lectures. However, due to the disconnect between shared innovation and entrepreneurship practices and professional education, the results are often minimal. Theoretical education on innovation and entrepreneurship should be integrated into professional education, achieving full staff, all-round, and full process education, and realizing the integration of specialization and entrepreneurship.

3.2 Difficulty In Integrating the First And Second Classrooms

Influenced by fixed thinking patterns and teaching habits, in the first classroom teaching process, teachers focus more on imparting theoretical knowledge of innovation and entrepreneurship, often using teaching methods such as lectures, demonstrations, and exercises, viewing students as recipients of knowledge and neglecting the cultivation of students' practical and autonomous abilities. Many universities have not given sufficient attention to extracurricular activities, and the practical hours and learning volume of innovation and entrepreneurship education courses are virtually non-existent. Although some universities offer practical courses on innovation and entrepreneurship, they still use credits and exam results as the final assessment criteria, ignoring the role of process evaluation, which makes it difficult to reflect the important significance of practical courses in innovation and entrepreneurship education. the innovation and

entrepreneurship practice course places high demands on teachers' professional qualities, especially their rich practical experience. Teachers of innovation and entrepreneurship courses lack professionalism, have insufficient flexibility in utilizing extracurricular activities, and the quality of practical courses is not high. [2]

3.3 Difficulty In Deep Integration Between Universities And Enterprises

Due to the lack of discourse power in the number of innovation and entrepreneurship education courses offered by enterprises, the time and frequency of guidance provided by enterprise mentors to students, and the lack of initiative and autonomy in school enterprise cooperation, the awareness of "main responsibility" cannot be reflected, gradually forming a situation of "integration of industry and education but not cooperation" and "cooperation but not cooperation" between schools and enterprises. At the level of value orientation in cultivating goals, enterprises pay more attention to whether there is a balance between investment costs and benefits, and their willingness to cooperate is decreasing day by day. At the level of school enterprise integration, students trained by enterprises through order training, apprenticeship programs, etc. have strong mobility after joining the company, and the gains of the enterprise are often disproportionate to the large amount of investment in the early stage. Universities lack effective integration with the actual needs of enterprises in terms of professional settings, talent cultivation, technology research and development, and social services, resulting in enterprises still needing to spend a lot of manpower, material resources, and financial resources on pre job training for personnel.

4. WAYS TO PROMOTE HIGH QUALITY DEVELOPMENT OF INNOVATION AND ENTREPRENEURSHIP EDUCATION IN COLLEGES AND UNIVERSITIES

4.1 Integrating Theory And Practice To Enhance the Effectiveness Of Education

Universities should pay attention to integrating resources, incorporating innovation and entrepreneurship education into the overall development plan of universities, and ensuring that it becomes a part of the school's characteristics and goals. Through top-level design, innovation and entrepreneurship education is closely integrated with the school's discipline construction, professional development, and talent cultivation, providing necessary support including entrepreneurship guidance, financial support, incubation platforms, etc., to help students overcome practical obstacles in entrepreneurship and stimulate their entrepreneurial enthusiasm. [3]

Universities should also increase the introduction and training of innovation and entrepreneurship education teachers, build a teaching team with both profound theoretical foundation and rich practical experience, and construct a "dual teacher" teaching team. Introduce innovative and entrepreneurial mentors with practical experience, such as industry experts and successful entrepreneurs, and regularly organize educational training, lectures, salons, and other activities to stimulate students' innovative thinking and entrepreneurial inspiration.

4.2 Break Down Classroom Barriers And Strengthen Platform Construction

Teachers should adopt interactive and exploratory teaching methods, encourage students to actively participate and think, and cultivate their innovation ability and entrepreneurial spirit. At the same time, more case studies and project practices should be designed to enable students to flexibly apply knowledge to solve practical problems.

Universities should establish a process evaluation system that includes assessment indicators such as student participation, innovative thinking, and teamwork ability, to comprehensively evaluate students' practical abilities. At the same time, it is necessary to integrate the positioning of the school with its professional characteristics based on the actual situation of the institution, and create a collaborative talent training system of "discipline foundation+professional skills+applied practice+innovative practice". In addition, building multi-level and diversified practice platforms, such as on campus entrepreneurship incubation bases, innovation and entrepreneurship laboratories, innovation and entrepreneurship competitions, etc., provides students with opportunities to showcase themselves and exercise their

abilities.

4.3 Deepen School Enterprise Cooperation And Promote Collaborative Education

Enhance the participation of enterprises in talent cultivation. Universities should collaborate with businesses to design courses that align educational content with societal needs and match the demands of businesses. Corporate mentors should regularly participate in student guidance work, allowing students to have earlier exposure to industry reality, understand corporate culture and work environment. Universities and enterprises should jointly formulate talent cultivation goals to ensure that school education is synchronized with enterprise needs. At the same time, enterprises should clarify their "main responsibilities" in talent cultivation and actively participate in school enterprise cooperation.

4.4 Universities And Enterprises Should Establish Long-Term Mechanisms.

By regularly holding school enterprise cooperation exchange meetings and establishing school enterprise cooperation committees, we can strengthen information exchange and resource sharing between both parties. Universities should attach importance to technology research and development cooperation with enterprises, and shorten the gap between school education and the actual needs of enterprises. Enterprises should provide necessary resources and information to help universities improve teaching methods, enrich teaching content, and enhance students' employment adaptability. [4]

5. CONCLUSIONS

To cultivate new quality productive forces, universities must systematically enhance innovation and entrepreneurship education by integrating theoretical frameworks with hands-on practice, consolidating interdisciplinary resources, strengthening faculty expertise, and optimizing pedagogical outcomes. This entails dismantling barriers between primary classrooms and secondary classrooms, while significantly expanding physical innovation platforms such as makerspaces and incubators. Further, it necessitates deepening industry-academia integration through enterprise-embedded learning, co-developed curricula, and joint R&D initiatives. Such synergistic education models will transform creative concepts into market-ready solutions while converting human capital into adaptive talent pipelines, ultimately fueling sustainable economic advancement through precisely trained innovators aligned with technological evolution and industrial transformation.

REFERENCES

[1] the Ministry of Education of the People's Republic of China Regulations on the Construction of Counselor Teams in Ordinary Higher Education Institutions [EB/OL].

[2] Gong Changrui From Big Data to Small Data: New Reflections on the Precise Development of Ideological and Political Education [J]. Research on Ideological Education, 2021(1):26-31.

[3] Liu Kang the dual dilemma and construction path of mainstream ideological discourse power in the context of "decentralized and decentralized" communication environment [J]. China Youth Research, 2019(5):102-109.

[4] Hu Qingyu Research on the Path of College Counselors Promoting Online Ideological and Political Education [J]. Beijing Education, 2023(10):86-89.

Research on the Path of Integrating Core Literacy into Physical Education Classroom Teaching in Colleges and Universities

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education teaching paths in colleges and universities as the research object, and adopts research methods such as literature method, expert interview method, logical analysis method, etc., and systematically explores the feasibility of integrating core literacy into physical education teaching in colleges and universities on the basis of comprehensively analyzing the importance of cultivating core literacy of students' physical education. This proposes the path to integrate core literacy into physical education classroom teaching in colleges and universities. In order to provide reference for comprehensively promoting the reform of physical education classroom teaching in colleges and universities.

Key words: Core literacy; colleges and universities; physical education classroom teaching; paths

1. INTRODUCTION

The cultivation of morality and talent is the fundamental task and practical requirement put forward by the Party for the education cause in the new era. the key to implementing the cultivation of morality and talent lies in developing students' core competencies. [1] Physical education classroom teaching is an important component of the school curriculum system, the main battlefield and key link for implementing core competencies, and an important way to implement quality education and cultivate well-rounded talents. [2] How to build a high-quality physical education classroom teaching system and deliver high-quality physical education classes has become a key, hot, and difficult issue in the deep reform of physical education teaching in universities in the new era. Integrating core competencies into physical education classroom teaching in universities will definitely produce good results.

2. THE IMPORTANCE OF CULTIVATING STUDENTS' CORE PHYSICAL LITERACY

In 2014, the Ministry of Education issued the "Opinions on Comprehensively Deepening Curriculum Reform and Implementing the Basic Task of Moral Education", which pointed out that the key to moral education is to promote the comprehensive development of students and build an education system centered on core competencies. the core competencies of physical education and health in regular high schools are defined as three main areas: athletic ability, healthy behavior, and sports ethics. [1] the core literacy of sports has occupied an important position in the curriculum of sports and health, which can be mainly seen from the requirements for cultivating students' healthy behaviors. Healthy behaviors require the improvement of students' individual physical and mental health levels. However, some physical education teachers still have many problems in their teaching practice. Some teachers overly focus on students' mastery of knowledge and skills, while neglecting the cultivation of students' core competencies. the implementation of the testing requirements for the "Student Physical Health Standards" is not in place, and the connotation of physical education courses is misunderstood, only believing that physical education classes are simply physical education knowledge education or free activity time. In order to reverse this situation, physical education should establish the subject status of students, focus on cultivating their interest and hobbies in sports, make them willing to actively engage in physical exercise, and establish a lifelong awareness of sports. By spreading

knowledge about health and civilization to students, adopting diverse teaching content and organizing various forms of sports activities, we help students relieve stress, cultivate their sentiments, guide them to establish a sense of health responsibility, and encourage them to actively improve their health status. Gradually, we cultivate good habits of daily life and healthy exercise, and enable students to adapt to social development more positively and optimistically.

3. FEASIBILITY OF INTEGRATING CORE COMPETENCIES INTO PHYSICAL EDUCATION CLASSROOM TEACHING IN UNIVERSITIES

3.1 Integrating core competencies into college physical education classroom teaching can improve the content of physical education teaching

College physical education classroom teaching can use the concept of core competencies and design implementation experience courses. In physical education classroom teaching, teachers arrange the learning of movement techniques for a certain sports event, or use virtual laboratories to simulate a certain sports event to arrange teaching tasks. Require students to learn how to observe, simulate, and actively seek solutions to problems. By collecting sports information and reasoning to understand the principles of movement techniques, proposing solutions to problems, and mastering the technical essentials of movements. In addition, utilizing physical education internship and training bases both on and off campus is a good example of designing and implementing experiential curriculum teaching.

3.2 Integrating core competencies into college physical education classroom teaching can reform physical education teaching methods

One of the prominent features of the core literacy concept is the emphasis on project-based "big unit" teaching. the integration of core literacy into university physical education classroom teaching should adopt a project-based teaching model, and differentiated teaching should be carried out based on students' sports interests and strengths. In the process of teaching implementation, teachers need to design thematic learning tasks and collaborative activity plans, highlighting students' dominant position in learning activities. By organizing group inquiry based learning, students are guided to independently discover, analyze, and solve problems, cultivating their information processing ability, innovative thinking ability, and teamwork ability, and achieving comprehensive improvement in their overall quality. At the same time, teachers should be good at using various teaching strategies, methods, and means to inspire students' innovative thinking and stimulate their learning potential. For example, using observation method, whole-body response method, heuristic teaching method, inquiry based teaching method, etc. for teaching, organizing teaching activities through inspiration, discussion, communication, cooperation, scene simulation, etc., encouraging students to use diversified channels such as computer networks and multimedia to obtain information related to learning sports projects, guiding students to cooperate and divide labor, obtain resources, share information, and communicate and analyze to involve all of them, cultivating students' teamwork spirit and hands-on practical ability. For example, in table tennis class teaching, teachers can first let students observe table tennis teaching videos, short films, or the technical essentials of a certain action. During the observation process, students can imitate and practice, understand the key points of the action, and then close their eyes to think and understand the action. Alternatively, heuristic teaching methods can be used to induce and inspire students to understand the technical essentials of the action and grasp the laws of basic action formation.

3.3 Integrating core competencies into college physical education classroom teaching can innovate sports orzational forms

The organizational form of teaching is a basic activity determined based on the relationship between teachers and students in order to successfully complete classroom tasks during teaching, that is, the arrangement and combination of teams. [4] Scientific and reasonable teaching organization strategies have a significant impact on improving classroom effectiveness, as they can optimize

the teaching process and ensure the achievement of teaching objectives. However, most universities in China still commonly use a simple grouping model based on gender in physical education teaching. This singular organizational form overly emphasizes unity and ignores individual differences among students, resulting in a lack of targeted teaching content, difficulty setting, and schedule arrangement. It is difficult to stimulate students' learning enthusiasm and meet the learning needs of students at different levels, ultimately leading to a polarization of teaching effectiveness. With the continuous reform and optimization of teaching, various organizational forms such as skill combinations, hobby combinations, and friendship combinations can be adopted in physical education classroom teaching. A successful teaching organization should cultivate and strengthen students' organizational discipline based on different types of textbooks, units, and classroom teaching objectives, striving to stimulate students' learning enthusiasm, transform passive learning into active learning, group students according to different skills, allow students to freely combine groups, or group students according to different interests.

4. INTEGRATING CORE COMPETENCIES INTO THE CONSTRUCTION OF PHYSICAL EDUCATION CLASSROOM TEACHING PATHS IN UNIVERSITIES

4.1 Conceptualizing the Teaching Objectives of Physical Education Classroom

The goal of physical education teaching is to envision or establish standards for achieving the expected results of teaching activities. [5] the integration of core competencies into college physical education classroom teaching should be based on improving students' awareness of physical and mental health, lifelong sports concept, sports ability level, health promotion ability, and practical innovation ability. Specific, operable, and quantifiable learning goals should be designed to fully reflect students' exercise will, cultivate competitiveness, enhance communication skills with others, and have the courage to break through their own qualities. By teaching students sports and health knowledge and skills, we aim to establish a healthy awareness and acquire the ability to exercise. By engaging in sports, one can enhance their physical fitness and improve their overall physical fitness. In sports competitions, students can be influenced by the spirit of fairness and justice in sports, thereby promoting the formation of correct sports ethics. In the course design stage, teachers should carefully plan course objectives, combine information technology with the concept of open sharing, and help students understand teaching objectives through the internet. Physical education teachers should first familiarize themselves with the content to be taught, assign tasks that meet students' abilities based on the content, and students complete the tasks according to the teacher's requirements. In addition, teachers need to combine physical education courses with students' personal abilities, guide students to learn through problems, and explore independently under the guidance of teachers, trying to apply existing knowledge to solve problems. Students can also use teamwork and collective strength to solve problems and clarify learning goals.

4.2 Design a core competency cultivation platform

The design of teaching platforms should revolve around students' mastery of sports knowledge and skills, cultivation of practical abilities, improvement of physical and mental health behaviors, and enhancement of sports ethics and moral behavior. Platform design should focus on cultivating core competencies, conduct in-depth research on each link and step, and develop detailed implementation plans. Physical education teachers should combine their own knowledge and experience to transform their ideas into practical teaching plans, and build a big data platform for students to watch, analyze, discuss, and learn. According to different sports units, the design scheme is collaboratively completed by different groups, and group members deepen their understanding of the design content through discussion and analysis. From traditional single classroom teaching to comprehensive, multi-mode, and modern large unit teaching, and from simple learning experience to comprehensive learning experience, physical education teaching

methods will become more diversified. This transformation will contribute to the gradual improvement of students' sports awareness and ability, achieving a spiral development.

4.3 Constructing a Physical Education Classroom Teaching System

The teaching content is the core of implementing the construction of the teaching system, and it is the bridge between the curriculum plan and the curriculum framework. What kind of core competencies should be emphasized in different age groups and age groups, which course content is repetitive and redundant, and how to make the difficulty and depth of the course content gradually increase in a spiral manner, all of these issues need to be considered. the integration of core competencies into physical education classroom teaching in universities should be based on major themes, tasks, concepts, or projects. Through diversified curriculum content design, innovative teaching methods, and flexible teaching organization models, the overall improvement of teaching quality can be achieved. In the process of cultivating students' sports skills, emphasis is placed on optimizing the learning experience, organically integrating elements such as technical mastery and habit formation, knowledge transmission and behavior guidance, emotional cultivation and character shaping, and integrating them into teaching practice to promote the coordinated development of students' body and mind, and cultivate the spirit of courage to challenge, perseverance, and positive progress. Make classroom organization more flexible and diverse, significantly improve teaching quality, and enhance teaching effectiveness, thereby further enhancing students' physical abilities, healthy behaviors, and sports ethics.

4.4 Running a physical education classroom teaching system

The integration of core competencies into university physical education classroom teaching can be achieved through the use of MOOCs, flipped classrooms, pan Ya platforms, Chaoxing live streaming, and smart trees to build teaching platforms. Teachers integrate key content from the core competencies of physical education and health, including scientific exercise methods, knowledge of balanced nutrition, disease prevention and control measures, sports injury response strategies, and safety protection skills, into a teaching case library and upload it to a digital teaching platform. Based on the platform's functions, systematic teaching activities are carried out. According to the task requirements, teachers provide feedback on students' completion status, track and monitor teaching effectiveness, conduct testing and evaluation, and summarize learning, ultimately presenting teaching results. With the help of information technology, teachers transform various scenes in physical education and health courses into virtual environments, achieving deep integration of virtual and real, digital and physical, online and offline, creating borderless classrooms, providing students with immersive learning experiences, and enhancing the interactivity and fun of the courses. Divide the entire class into several small groups, with the group leader responsible for organizing learning tasks for each group. After completing the task, each group will select one representative to present the results in class, including the design ideas, implementation process, practice methods, and organizational forms of the task. At the same time, questions or opinions can be raised for reference, discussion, and improvement by other groups. After the presentation, the teacher provides real-time feedback and supplementary guidance to ensure an active classroom atmosphere and smooth completion of teaching tasks, while also achieving a combination of online and offline activities. This form not only fully showcases students' personalities and expression abilities, but also cultivates their sense of competition, cooperation, collective honor, and achievement, thereby tempering their sound personality.

5. CONCLUSION

The integration of core literacy into the construction of the physical education classroom teaching system in universities should be guided by socialist core values and scientific views on sports and health, with the fundamental task of cultivating morality and nurturing people, and adhering to the guiding ideology of "health first". Taking it as our responsibility to enhance students' core competencies, we strive to make the necessary contributions to improving their physical

abilities, promoting healthy behaviors, and enhancing their sportsmanship.

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REFERENCES

[1] the Ministry of Education of the People's Republic of China Curriculum Standards for Physical Education and Health in Ordinary High Schools (2017 Edition) [M]. Beijing: Beijing Normal University Press, March 12, 2022
[2] Lin Chongde Core competencies for student development: what kind of people should be cultivated for the future. Chinese Journal of Education, 2016(06):1-2
[3] Zhao Fuxue, Cheng Chuanyin Guidance and Cultivation of Core Competencies in Student Physical Education [J]. Journal of Chengdu Sport University, 2018, 44(06):104-109
[4] Qiu Liefeng, Xiao Shuang Research on the cultivation strategy of core competencies in sports and health disciplines [J]. Sports Science and Technology, 2019, 40(04):22-23
[5] Luo Xiaomei the current situation and practical path of cultivating core competencies in physical education for college students based on the concept of animal commerce [J]. Sports Science and Technology, 2023, 44(04):92-94
[6] Zhu Xiaomin, wait Research on the Education Function of College Physical Education under the Guidance of Core Literacy [J]. Sports Culture Guide, 2024, 5(05):92-97
[7] Li Jian Research on Performance Evaluation of Physical Education Learning Based on Core Competencies [J]. Chinese Journal of Education, 2025, 3(03):96-101

From “Unidirectional Control” to “Multistakeholder Collaboration”: the Practice of Safety Governance in University Student Dormitories

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posed a severe threat to students' personal and property safety, attracting widespread social attention to dormitory safety management in universities. According to statistics from the Ministry of Education, over 80% of dormitory fire accidents in universities nationwide from 2018 to 2022 were related to the use of unauthorized electrical appliances or aging electrical circuits, highlighting the insufficiency of traditional “unidirectional control” models in management efficiency. the “National Campus Safety Special Rectification Action Plan” in 2023 explicitly proposed “promoting multistakeholder collaborative governance, ” calling for universities to break through the single administrative management system and build a new type of collaborative governance framework. However, the safety governance of university student dormitories in China still faces many challenges, such as single management entities, outdated technological means, and weak safety culture, which seriously restrict the improvement of the safety governance level of university student dormitories and urgently need to be solved through innovative governance models.

Keywords: Multistakeholder collaboration; Student dormitory; Safety governance

1. INTRODUCTION

As an important place for student learning and living, the safety governance of university student dormitories is not only related to the life and property safety of students but also has an important impact on the educational order of universities and social stability. Therefore, in-depth research on the path of safety governance in university student dormitories has important theoretical and practical significance.

2. PROMINENT ISSUES IN SAFETY GOVERNANCE OF STUDENT DORMITORIES

2.1 Single Management Entity

The management of student dormitories in Chinese universities generally suffers from a single management entity. the “Standardization Guide for Management in Ordinary Higher Education Institutions” from the Ministry of Education points out that in most institutions, dormitory management personnel are responsible for more than 80 dormitory rooms per person, making it difficult to balance inspection and emergency response. This “single combat” management model leads to excessive work pressure on dormitory managers and low management efficiency. For example, a dormitory manager in a university reflected that due to the large management area, only part of the dormitories could be inspected each day, making it difficult to detect and deal with safety hazards in a timely manner. In addition, there are differences in the professional quality and management capabilities of dormitory managers, and some lack the necessary safety knowledge and emergency response capabilities, affecting the effectiveness of safety management.

2.2 Technological Lag

Traditional manual inspection methods fail to detect hidden risks, making it difficult to eliminate safety hazards in a timely manner. For example, aging electrical circuits require regular inspections, but manual checks are

prone to omissions and delays. In contrast, the University of Tokyo in Japan uses Internet of Things sensors to monitor electricity load in real time, increasing the efficiency of electrical fire early warning by 60%. the application of such technological means not only improves the timeliness and accuracy of early warning but also reduces management costs. In China, some universities have also begun to try to introduce intelligent monitoring equipment, but the overall coverage rate is still low.

3. EXPLORATION OF THE PATH OF MULTISTAKEHOLDER COLLABORATIVE GOVERNANCE

3.1 Division of Responsibilities

Student Role Transformation. As direct users of the dormitory, students should shift from being passive recipients of management to “safety co-managers. ”Taking Cornell University in the United States as an example, students not only participate in daily safety inspections but are also given the right to supervise the rectification of hidden dangers. This model not only increases student participation but also enhances their sense of responsibility. In Chinese universities, this experience can be learned from by establishing student safety inspector positions, regularly organizing training to enable students to identify and report safety hazards, such as the use of unauthorized electrical appliances and blocked fire exits.

Optimization of Dormitory Manager's Role. the role of dormitory managers should shift from being a mere executor to a“coordination hub. ”Berlin Institute of Technology in Germany has established a “dormitory safety coordinator” position, responsible for coordinating student feedback and departmental collaboration. In Chinese universities, dormitory managers can take on a similar role by establishing an information feedback mechanism to promptly convey safety hazards reported by students to relevant functional departments and coordinate their emergency responses. For example, when an aging electrical circuit is discovered, the dormitory manager can quickly contact the logistics department for repairs while informing students of the progress, ensuring that the problem is resolved in a timely manner.

Strengthening of Functional Department Responsibilities. Functional departments should provide resource support for dormitory safety governance. Sorbonne University in France has included safety governance funds in the university's annual budget, increasing the proportion to 15% of the logistics expenditure. Functional departments in Chinese universities, such as logistics, security, and student affairs, should clarify their respective responsibilities in dormitory safety governance, such as logistics being responsible for facility maintenance, security for emergency response, and student affairs for student education. At the same time, a special budget should be established to ensure the smooth progress of safety governance work.

3.2 Technological Empowerment

Development of Low-Threshold Technological Tools: Developing low-threshold technological tools can reduce the difficulty for students to participate in safety governance. For example, Zhejiang University's “Safety Snap” WeChat mini-program allows students to upload hidden danger information through photos and check the progress of handling. the development and promotion of such tools not only increase student participation but also enable safety hazards to be fed back and dealt with in a timely manner. Chinese universities can learn from this experience by developing similar mini-programs or apps to facilitate students' participation in safety governance anytime and anywhere.

Deployment of Intelligent Monitoring Equipment: Deploying intelligent monitoring equipment can effectively enhance the early warning capability for safety hazards. Seoul National University in South Korea has installed AI cameras in dormitory buildings, which automatically warn against the use of unauthorized electrical appliances through behavior recognition, with a false alarm rate of less than 5%. Chinese universities can gradually deploy intelligent smoke detectors, intelligent electricity monitoring equipment, and other intelligent monitoring devices according to their actual conditions to achieve real-time monitoring and early warning of dormitory safety hazards. For example, a university successfully prevented several fire accidents through the installation of intelligent

smoke detectors.

4. DIFFICULTIES AND CHALLENGES FACED

4.1 Difficulties in System Implementation

In the practice of safety governance in university student dormitories, establishing a "triple-entity responsibility" system is the foundation for achieving multistakeholder collaborative governance. However, in actual operation, the collaborative mechanism among the three entities faces many coordination issues. First, although the role positioning and responsibility division among students, dormitory managers, and functional departments have been theoretically clarified, there are still some ambiguous areas in actual practice. Second, as the "coordination hub" between students and functional departments, dormitory managers need to conduct effective communication and coordination. However, due to the lack of unified coordination standards and norms, dormitory managers often face many difficulties in actual work.

4.2 Challenges in Technological Application

In the safety governance of university student dormitories, promoting lightweight technological tools is an important means to improve governance efficiency. However, in actual application, there are many obstacles to the promotion and use of these tools. First, when developing and promoting technological tools, some universities fail to fully investigate students' needs and usage habits, resulting in poor user experience of the tools. Second, the promotion and use of technological tools require certain technical support and training. Some students and dormitory managers have weak acceptance of new technologies and lack necessary technical training and guidance, making it difficult for them to skillfully use these tools.

5. STRATEGIES AND SUGGESTIONS FOR ACHIEVING MULTISTAKEHOLDER COLLABORATIVE GOVERNANCE

5.1 Improving the Mechanism for System Implementation

To address the coordination issues among the three entities, universities should establish a systematic training program targeting students, dormitory managers, and functional departments. At the same time, regular coordination skills enhancement training should be organized for dormitory managers, inviting management experts to share cross-departmental communication techniques and case studies to help them better play the role of a "coordination hub. " Moreover, establishing a regular communication mechanism is crucial. Universities can set up an online platform for "triple-entity collaborative governance, " where students, dormitory managers, and functional department staff can post information, report issues, and share experiences in real time. Monthly trilateral collaborative governance work exchange meetings should be held to summarize experiences and lessons learned, optimize collaborative processes, and gradually eliminate ambiguities in role positioning and communication barriers.

5.2 Optimizing Technological Application Strategies

When developing lightweight technological tools, universities should conduct thorough research on the needs and usage habits of students and dormitory managers, focusing on user experience in the design process. Development teams can invite students and dormitory managers to participate in the testing and improvement of these tools, optimizing operational procedures and functional settings based on their feedback. Additionally, improving the compatibility of technological tools is essential. Safety hazard reporting mini-programs should be compatible with mainstream smartphone operating systems, such as Android and iOS. For intelligent monitoring equipment, products that meet national and industry standards should be selected to ensure seamless interconnectivity and data sharing among devices.

5.3 Enhancing Cultural Cultivation Measures

Universities should incorporate safety education into the mandatory curriculum for students, offering a specialized course on "Safety Governance in Student Dormitories" that systematically covers safety knowledge, laws and regulations, and emergency response methods. the course can be delivered through a combination of online and offline formats, with online courses providing rich teaching resources and interactive platforms, while offline courses enhance student engagement

and practical skills through case studies, group discussions, and field drills. In addition, regular diversified safety education activities should be organized, such as safety knowledge competitions, safety scenario drama contests, safety evacuation drills, and safety-themed class meetings. By continuously conducting safety education activities, students' safety awareness and sense of responsibility can be gradually improved, embedding safety culture deeply into their minds.

6. CONCLUSION

The traditional “unidirectional control” model in the safety governance of university student dormitories has numerous limitations, such as a single management entity, outdated technological means, and a weak safety culture, which fail to meet the current needs of dormitory safety management in universities. In contrast, the path of multistakeholder collaborative governance can effectively integrate various resources and fully leverage the advantages of students, dormitory managers, and functional departments to enhance the scientific nature and effectiveness of safety governance.

In terms of institutional restructuring, establishing a “triple-entity responsibility” system and clarifying the responsibilities of students, dormitory managers, and functional departments is the foundation for achieving multistakeholder collaborative governance. Measures such as setting up student safety inspector positions, establishing cross-departmental liaison meeting systems, and implementing safety hazard reporting reward mechanisms can effectively stimulate students' enthusiasm for participation, improve dormitory managers' coordination capabilities, and strengthen the resource support of functional departments, forming a collaborative governance synergy. In terms of technological empowerment, promoting lightweight collaborative tools, such as safety hazard reporting mini-programs and intelligent monitoring equipment, can effectively enhance the early warning capabilities for safety hazards and improve governance efficiency. By analyzing historical accident data and optimizing resource allocation, scientific governance can be achieved. In terms of cultural cultivation, designing diversified safety activities, such as safety scenario drama contests and safety knowledge competitions, promoting anonymous participation channels, and applying psychological strategies to enhance students' sense of collective honor can effectively improve students' safety awareness and participation, creating a positive safety culture atmosphere.

REFERENCES

[1] QIN Hongxia, LIN Bingbing. Joint Governance of Campus Safety in Higher Education Institutions: Experiences and Insights from the United States [J]. Beijing: Educational Research, 2017.7(450)154-159.

[2] QIN Hong, QIN Wei, WU Dening. Reflections on the Construction of a Three-dimensional Safety Prevention and Control System in Higher Education Institutions—Taking Central China Normal University as an Example [J]. Wuhan: School Party Building and Ideological and Political Education, 2017.5(552)87-88.

[3] MENG Liang, ZHANG Guanglei. Construction of a Safety Prevention and Control System in Higher Education Institutions Based on the 4R Crisis Management Theory [J]. Hunan: Modern University Education, 2017.4:91-96.

[4] YANG Zhen. the Philosophy and Principles of Safety Education for College Students [J]. China Higher Education, 2015.

[5] XIE Yi. A Study on the Problems and Countermeasures of Student Safety Management in Chongqing W University [D]. Chongqing: Southwest University, 2019.9.

Management in Higher Vocational Colleges from the Perspective of Grid-based Governance [D]. Anhui: University of Anhui, 2019.5.

Challenges and Strategies for Commercial Banks in Pension Finance

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Abstract: the development of pension finance is an important strategic plan for China to actively respond to the trend of population aging and promote the high-quality development of pension economy. As the core sector of China's financial system, commercial banks play a key role in promoting the high-quality development of pension finance. However, the current development of pension finance by commercial banks is characterized by the problems of insufficient organizational structure, difficult to cross the digital divide in the elderly group, supply constraints faced by pension service financial products, and difficulties in financing the pension industry. In view of these problems, this paper starts from the perspective of commercial banks, and explores the strategies of commercial banks to promote the development of pension finance by improving the organizational structure of pension finance, enhancing the aging sensibility of digital pension product services, innovating the supply of pension service financial products, and exploring the business model of pension industry investment and financing.

Keywords: Commercial Banks; Pension Finance

1. BACKGROUND AND SIGNIFICANCE OF THE STUDY

At present, China has entered a deep population aging society, and one of the challenges brought by population aging is how to guarantee the healthy and smooth development of the social pension security system. the report of the 20th CPC National Congress pointed out the need to improve the national coordination system of basic pension insurance and develop a multi-level and multi-pillar pension insurance system. 2023 In October, the Central Financial Work Conference pointed out the need to do a good job in the big article of pension finance, which was first put forward in the central meeting. 2024 In January, the General Office of the State Council issued the Opinions on Developing the Silver Economy and Enhancing the Well-being of the Elderly, which required that financial institutions to enrich the development of pension financial products and increase support for the construction of pension service facilities and silver-hair economy industry projects. 2024 On December 12, 2024, the Ministry of Human Resources and Social Security and other five departments jointly issued the Notice on the Comprehensive Implementation of the Individual Pension System, marking the official implementation of China's individual pension system on a nationwide scale.

In China's financial market, commercial banks play an important role and also bear certain political and social responsibilities. Commercial banks have natural advantages in the development of pension finance business with the help of large capital scale, wide customer base and many grass-roots business outlets. Vigorous development of pension financial business by commercial banks is conducive to the innovation of their financial products and services to meet the diversified pension financial needs of customers, promote social harmony, and also help to realize the development of commercial banks themselves. With the increasing trend of population aging, commercial banks are facing many new challenges as well as new opportunities in the field of pension finance, and it is of great significance for commercial banks to actively explore the development of pension finance.

2. THE CURRENT DEVELOPMENT OF CHINA'S PENSION FINANCIAL SYSTEM PROBLEMS

2.1 Organizational structure is not perfect

Although the commercial banks attach great

importance to the development of pension financial business, but due to the development of China's pension financial business is still in its infancy, the commercial banks in the pension financial business of the organizational structure has to be improved. Pension finance is different from the traditional commercial banking business, which includes not only the traditional pension service but also involves the planning of the pension market and industry, and is a business that requires the integration of multiple departments. At present, most commercial banks have not set up specialized pension business departments, although some banks have also set up independent functional departments, but their functions are often limited to the annuity trusteeship, account management and other businesses in the pension finance, and do not cover the pension service finance and the pension industry finance-related businesses, at the same time, the pension finance business of commercial banks is mainly based on products or departments as a unit. At the same time, commercial banks' pension finance business is mainly based on products or departments. Such organizational structure cannot fully and effectively integrate the advantageous resources of the whole bank, and is not conducive to the unified planning of pension finance business and brand building of commercial banks.

2.2 The digital divide of the elderly group is difficult to cross

The lack of digital literacy of the elderly group, as the main service object of pension finance, has become the primary problem restricting the development of pension finance business of commercial banks. In the digital era, smartphones, online banking, mobile payment and other emerging technologies have become the main channels for financial services. However, for most of the elderly, these new technologies are like an insurmountable gap. According to data released by the China Internet Information Center (CNNIC), as of December 2021, the proportion of Internet access among the elderly population aged 60 and above in China was only 43.2%, a figure far lower than the national average of 73%, highlighting the phenomenon that the elderly are significantly lagging behind in the wave of digitization.

2.3 Pension service financial products face supply constraints

With the deepening of social aging, commercial banks have also launched pension service financial products. However, the existing pension financial products cannot effectively meet the financial needs of residents. the reason for this is that, first, the commercial banks launched pension service financial products are seriously homogenized. Most of the current pension financial products have low yields, unclear product introductions, too long investment periods, etc. Residents may prefer other financial products when investing; secondly, the current pension financial products are not precisely designed enough. Some commercial banks have fine-tuned their original financial products so as to form new pension financial products, without well highlighting the pension function and long-term attributes of pension financial products; third, the promotion of pension financial products is slow. For example, specific pension savings products have not yet been promoted nationwide since they were piloted in five cities in 2022.

2.4 Financing Difficulties for the Pension Industry

In recent years, China has actively advocated that financial institutions focus on the financing needs and characteristics of the pension industry, and increase support for its projects. However, despite the many policy guidance and incentives, the problem of financing the elderly industry is still more prominent. This is centrally manifested as a single channel of financing for the senior care industry, mainly in the form of government capital investment, policy bank loans and other traditional financing methods, and the lack of willingness of commercial banks to invest in the senior care industry. the main reason why commercial banks are reluctant to provide credit support for the pension industry is that the pension industry is more risky, the demand for capital is large, the payback period is long, and the profit model is imperfect. By inquiring into the 2023 annual reports of some commercial banks, it is found that most of the commercial banks in China are in the strategic planning stage in terms of financial services for the pension industry.

3. STRATEGIES FOR COMMERCIAL BANKS TO DEVELOP PENSION FINANCE

3.1 Improve Organizational Structures for Pension Finance

At present, China's pension demand presents a diversified and composite development trend, and the comprehensive service requirements for pension finance business are getting higher and higher. Fragmented organizational structure and management mode will cause service fragmentation, fuzzy business scope boundaries and other problems, restricting the systematic development of pension financial business. Commercial banks can explore the establishment of a specialized pension finance department to coordinate the management of pension finance, pension service finance and pension industry finance-related affairs, covering pension finance, pension market development, customer base development and management, pension product R& D and layout, pension asset project operation, pension customer after-sales service management, etc., fully integrating the bank's high-quality resources to form a whole-process, all-around pension finance management structure.

3.2 Enhance Accessibility of Digital Pension Products

Through modern communication media such as smartphones, commercial banks promote the ageing adaptation of digital senior care products from the perspective of technological optimization in order to enhance the experience and satisfaction of the elderly user group. Specifically, commercial banks significantly simplify the operation process of digital senior care products and information service platforms to enhance the ease of use and accessibility for senior users in different application scenarios, so as to satisfy their growing needs for digitalized life. In addition, in the design of privacy and security of digital products, the security and confidentiality of private data of elderly users are ensured through the construction of a strong risk interception mechanism and a back-end supervisory system, so as to further enhance their sense of trust in digital products. On this basis, it actively promotes the construction and improvement of a comprehensive information platform for digital senior citizens, through which it realizes in-depth cross-enterprise and cross-departmental cooperation and resource sharing, promotes the synergistic optimization of digital senior citizens' product and service functions and comprehensive governance, and provides senior citizens with a more comprehensive, detailed and thoughtful digital senior citizens' service.

3.3 Innovate Pension Financial Product Offerings

For people of different ages, banks should, through market research and other forms, gain an in-depth understanding of their needs for financial products for the elderly, grasp the characteristics of the clientele, and create differentiated financial products for elderly services. In the face of senior citizens, banks should continue to explore innovative wealth inheritance financial products, such as the Pudong Development Bank Group's family trust service, which is aimed at the senior citizens who emphasize physical health and high consumption. In view of the characteristics of the energetic elderly group, which emphasizes on physical health and high consumption, the effective supply of financial products with high liquidity can be increased, such as deposits and wealth management, to meet the consumption demand of the energetic elderly group. In response to the middle-aged group's desire to preserve and increase the value of their wealth, we have strengthened the supply of specific pension savings, pension finance, pension target funds, commercial pension insurance and other products, and increased the sales and promotion of high-quality pension products in the market in order to build a broadly covered system of financial products for the elderly.

3.4 Explore Investment and Financing Models for the Pension Industry

First, increase the effective supply of specialized credit products and strengthen credit support. We have customized credit products for different types of senior care institutions, such as pledge loans based on dedicated land and facilities and accounts receivable, and we have also given full play to the “universal” attributes of commercial banks to create products such as special refinancing loans for universal senior care. Secondly, commercial banks should give full play to their comprehensive management advantages

to realize the sustainable development of the senior care industry. Industries that are closely related to senior care institutions include rehabilitation and nursing care, medical care, senior tourism, health management, and intelligent senior care equipment, etc. Commercial banks can strengthen cooperation with related enterprises, integrate credit resources, and realize investment and loan linkage, thus promoting the sustainable development of the senior care industry. Third, actively explore the securitization of senior care assets. In view of the long operating cycle and stable cash flow of senior care service institutions, the securitization of senior care assets can also be realized through senior care REITs and other means, attracting more social capital to enter and realize the sustainable development of the senior care industry.

REFERENCES

[1] Sun Jun, Yang Bo. Trends in the Silver Economy and Support Strategies for Commercial Banks—A Case Study of Agricultural Bank's County J Branch [J]. China Economic & Trade Herald, 2025(02):139-141.

[2] Ba Shusong, Gong Shuhao, Li Nina, et al. Inflection Points in China's Pension Industry—Typical Facts Based on Multi-Case Studies [J]. Southwest Finance, 2024(04):74-86.

[3] Zhu Chunhua, Shi Xiaodan. Paths for Commercial Banks to Support High-Quality Development of the Silver Economy—From the Perspective of Pension Industry Growth [J]. Southwest Finance, 2024(07):77-87.

[4] Guo Jinlong, Li Hongmei. International Comparative Study on Pension Financial Products [J]. Price Theory & Practice, 2022(01):61-67.

Research on the Safety of College Students and the Handling of Emergency Incidents

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Abstract: In today's society, universities, as important bases for talent training, have attracted much attention to the safety of their students. With the development of the times the background of student safety management in universities is becoming increasingly complex. the popularity of the Internet and communication devices has made information dissemination more rapid, but it has also brought many hazards. the student group is mainly post-00s, who grew up in a relatively superior environment, with relatively weak stress resistance and increasingly prominent psychological problems.

In this context, it is of great significance to study and deal with emergency incidents involving students. University students are the future and hope of the country, and their safety is the foundation for universities to carry out normal educational and teaching activities, and also an important aspect of maintaining social harmony and stability. Through in-depth research, it is to improve the safety management system for university students, enhance emergency response capabilities, create a favorable environment for the growth and development of students, help universities achieve the goal of training high- talents, and promote the healthy development of higher education.

Keywords: College student safety; sudden emergency incidents; handling research

1. CHALLENGES FACING CAMPUS STUDENT SAFETY

1.1 The Impact of the Network Information Era

In the network information era, college students face a variety of security issues. Information leakage incidents occur time to time, and students' personal information, such as ID numbers and contact information, are easily obtained by criminals for illegal activities such as fraud. the means of online fraud are endless, with false part-time jobs and online shopping fraud trapping many students and causing them financial losses. the spread of computer viruses also threatens students' online security, which may lead computer system crashes and loss of personal data. Moreover, some bad information on the Internet, such as violent and pornographic content, can have a negative impact on students' values and health, disrupt students' normal learning and life, and bring new challenges to the safety management work of college students.

1.2 Trends in Student Psychological Issues

Currently, there are some new trends in psychological health issues among college students. Anxiety is relatively, with academic pressure, employment competition, and interpersonal relationships causing students to feel anxious and worried that they cannot meet expectations. Depressive moods are also spreading among students, with students falling into a state of depression due to setbacks in life and emotional problems, experiencing low moods, loss of interest in things, and even suicidal tendencies. Internet addiction has become a significant factor affecting students' psychological health, with some students becoming overly dependent on the internet, indulging in online games and social media, leading to social barriers in real life declining academic performance, and other issues, severely affecting students' physical and mental health and future development.

1.3 Threats to the campus and its surrounding environment

There are many factors that threaten students' safety both inside and outside the campus. In of traffic safety, the traffic conditions at the school gate and its surrounding areas are complex and there are many vehicles, making

it easy for students to have traffic accidents when they travel. safety should not be overlooked either. Canteens on campus and restaurants in the vicinity may have hygiene problems, such as stale ingredients and substandard processing environments, which can easily to food poisoning among students. Laboratory safety is also a matter of concern. If the operation is improper during the experiment, chemical spills, fires and other accidents may occur. There also hidden dangers in the security environment around the campus. Some lawless elements may commit crimes such as robbery and fraud against students, posing a threat to the life and property safety of.

2. THE RESPONSIBILITIES OF UNIVERSITY STUDENT MANAGERS IN STUDENT SAFETY

2.1 Coordinate the work of various departments

In the work of student safety, the management personnel of colleges and universities need to fully play the role of coordination. First of all, regular safety work meetings be organized to clarify the responsibilities of various functional departments of the college, such as the office of academic affairs, the office of student affairs, the logistics department, etc. in the work of student safety, to form a consensus. Secondly, an effective communication mechanism should be established to ensure the smooth flow of information between various departments. When problems involving student occur, relevant departments can be coordinated to respond together in time, such as jointing with the security department and the logistics department to investigate potential safety hazards on campus, and cooperating the student affairs department to carry out safety education activities, etc., to form a good situation of joint management and protection of student safety.

2.2 Emergency decision-making and command

In the event of a sudden emergency involving students, student affairs personnel are key figures in emergency decision-making and command. They need to quickly understand the situation accurately judge the development of the situation, and initiate emergency plans in the first time. Depending on the nature of the event, they organize and coordinate various resources, such as contacting and public security departments for rescue. They also promptly report the situation to higher authorities and relevant departments to ensure accurate information transmission. They should also comfort the students' emotions, maintain order the scene, prevent the situation from further expanding, and, with decisive decisions and powerful command, maximize the protection of students' lives and property safety, and minimize the impact of emergencies.

2.3 Push for the improvement and implementation of the system

Student management personnel should actively promote the improvement and implementation of student safety systems. On the one hand, organize relevant personnel to conduct a comprehensive review and evaluation the existing safety system, revise and improve the system in accordance with the actual situation of the college and the new safety situation, and ensure the scientificity and operability of the system On the other hand, strengthen the publicity and training of the system, and let teachers and students understand and comply with the safety system through activities such as lectures and training. Establish supervision mechanism for the implementation of the system, regularly inspect the implementation of the system, and rectify the existing problems in a timely manner to ensure that all safety systems are truly implemented provide a solid institutional guarantee for student safety.

3. ANALYSIS OF EMERGENCY INCIDENTS IN COLLEGES AND UNIVERSITIES

3.1 Types and characteristics of events

The types of emergency incidents in colleges and universities are diverse. Psychological crisis incidents are relatively common, where students may fall into states of anxiety, depression etc., due to academic pressure, interpersonal relationships, and other issues. These incidents have the characteristics of concealment and suddenness, and if not discovered and intervened in, they may lead to serious consequences. Group incidents also occur from time to time, such as campus fights, collective protests, etc. These incidents involve a large number of participants and a wide range of impact, causing significant

social effects and are prone to attract public attention. There are also accidental injury incidents, such as traffic accidents, sports injuries, etc. which have the characteristics of randomness and unpredictability, and once they occur, they can directly harm the students' bodies. Public health incidents, such as food poisoning, outbreaks of diseases, etc., have the characteristics of fast diffusion speed and wide range of harm, posing a serious threat to the students' lives and health.

3.2 The cause of the event

The causes of psychological crisis events are complex. On the family front, high parental expectations and strained parent-child relationships can lead to a lack of security high psychological pressure among students. In academics, increasing course difficulty and fierce competition can easily cause students to feel a sense of frustration. Employment pressure also causes students to be anxious about the. In interpersonal relationships, conflicts with classmates and teachers can leave students feeling lonely and helpless. the occurrence of group events is closely related to social environmental factors. Domestic and foreign-economic issues can easily trigger student attention and discussion, and if not handled properly, they may escalate into group events. Inadequate school management, such as poor logistics service unreasonable student activity arrangements, may also become the fuse. Students' own psychological immaturity and unstable values also make them prone to participate in group events in specific situations.

4. THE INADEQUACIES OF THE EXISTING SAFETY MANAGEMENT SYSTEM AND EMERGENCY RESPONSE MECHANISM.

4.1 Emergency plan issues

The emergency plans for college students have many problems in terms of perfection and operability. Some of the plans are too vague and lack specificity, making it to take targeted measures in the face of specific emergencies. the plans are not updated in a timely manner, failing to keep up with the new types of safety risks that continue to emerge such as new means of online fraud, and the corresponding response measures are not updated in a timely manner. Some plans lack the test of actual combat exercises, and their operability questionable. In the event of an emergency, there may be a disconnect between the plan and the actual situation, failing to effectively guide emergency response, resulting in low efficiency of emergency response inability to control the development of the situation in a timely manner.

4.2 Professional quality of staff

There are deficiencies in the professional quality and training of emergency personnel in colleges and universities. Many emergency personnel lack systematic professional training, and when facing complex and changeable emergency events, they lack sufficient professional knowledge reserves and find it difficult to take scientific and effective measures. the training content is often theoretical, neglecting practical skills, resulting in personnel lacking experience in actual operations and being prone to panic in emergencies, unable to quickly and accurately judge and deal with problems. the training methods are also relatively single, lacking effective forms such as simulation drills and case analysis, which makes it difficult to truly improve the emergency response capabilities of personnel and affects the overall effectiveness of emergency work.

4.3 Information communication mechanism

The current emergency information communication mechanism for college students is not highly efficient, and there are issues with the timeliness and accuracy of information transmission. the process reporting information is cumbersome, with approvals required at every level from students to counselors and then to college leaders, which can be time-consuming and may result in missing the best for emergency response. Communication channels are not smooth, with high information barriers between different departments, making it difficult to achieve information sharing, which results in a lack of synergy in responding emergencies. the information release platform is not perfect enough, and the scope and speed of information dissemination are limited, which fails to transmit important information to all relevant personnel in a timely, affecting the speed and effectiveness of emergency response and is not conducive to quickly controlling the situation.

5. STRATEGIES TO IMPROVE THE SAFETY MANAGEMENT SYSTEM AND ENHANCE EMERGENCY RESPONSE CAPABILITY.

5.1 Strengthen safety education

Universities should enrich the forms of safety education, carry out a variety of safety theme activities, such as safety knowledge competitions, safety scenario simulations,., to enhance students' sense of participation and experience. Regularly invite professionals to give safety lectures, explaining knowledge such as fire prevention, theft prevention, fraud prevention, and drowning, as well as self-rescue and mutual rescue skills in the event of danger. Make full use of campus radio, bulletin boards, WeChat official accounts and other platforms release safety tips and cases, and enhance students' awareness of safety. Tailor-made safety education plans should be formulated according to the characteristics of students in different grades, majors andenders, such as focusing on the enrollment safety education for freshmen and strengthening the employment safety guidance for graduates, to improve the pertinence and effectiveness of safety education.

5.2 Utilizing information technology

Universities can build smart safety management platforms, integrate campus monitoring, access control, alarm and other systems, and achieve real-time monitoring and intelligent of campus safety. By using face recognition technology, the management of dormitories and campus entrances and exits can be strengthened to prevent outsiders from entering at will. Through big analysis, the data such as students' behavior trajectory and consumption records are mined to discover potential safety hazards in time. An early warning system is established to warn in advance of natural, public health incidents, etc., and timely notify teachers and students through text messages and APP push notifications. By using the Internet of Things technology, remote monitoring of laboratory equipment campus facilities is carried out to ensure the normal operation of equipment, prevent the occurrence of safety accidents, and improve the efficiency and quality of safety management.

5.3 Establish exercise mechanism

Universities should formulate scientific and reasonable emergency plans that cover all kinds of emergencies, clarify the responsibilities of relevant departments and personnel, and stipulate disposal process and resource allocation. A regular drill mechanism should be established to organize teachers and students to carry out fire drills, earthquake evacuation drills, emergency evacuation drills, etc., so teachers and students are familiar with the emergency process and self-rescue and mutual rescue methods. After the drill, a timely summary and evaluation should be made to find out the existing and shortcomings, and the emergency plan should be revised and improved. Students are encouraged to participate in the organization and implementation of emergency drills, set up student emergency volunteer teams, and their emergency response and teamwork capabilities. Through actual combat drills, the ability of universities to deal with emergencies should be continuously improved to ensure the safety of teachers and students.

6. CONCLUSION

This paper focuses on the safety of college students and the handling of emergency student incidents, analyzing the challenges faced by college student safety in the era of network, the trend of psychological issues, and the campus environment. In the future, the safety management work of college students should further strengthen the application of advanced technologies such as big data and intelligence, and build an intelligent and three-dimensional safety prevention and control system. It is necessary to explore effective intervention mechanisms for students' psychological health issues, strengthen the construction of counseling teams, improve the legal system of emergency handling, and provide stronger legal support for the emergency handling of colleges and universities. It is necessary to strengthen the exchange and cooperation of safety experience with international universities, learn from advanced practices, and continuously improve the safety management and emergency handling capabilities of college students, and create a more safe and stable growth environment for students.

REFERENCES

[1] Liu Weiping, Research on the Innovation

of Crisis Management in Colleges and Universities: the Perspective of Harmonious Culture, September 2014, published by Hunan People's Publishing House.
[2] Xu Kai, Li Yang, Research on Prevention and Intervention of Psychological Crisis in Colleges and Universities, March 2018, Jiuzhou House.
[3] Wang Shao Rang, Wang Xing Jie, Xu Jun, Standardized Research on the Disposal of Emergency Events in Colleges and Universities, Issue10, 2010, Academic Review.

Research on the Application of Artificial Intelligence Technology in the Work of College Counselors

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Abstract: With the deepening implementation of the digital education strategy, artificial intelligence technology has provided a new path for innovation in the work of university counselors. This article systematically explores the specific application modes of artificial intelligence technology in the work of counselors, including the construction of a virtual counselor intelligent question and answer system, student portrait analysis based on big data, intelligent education resource push and other practical strategies. Research has shown that through the mechanism of human-machine collaboration, the construction of a three-dimensional human body system, and the creation of an emotional content matrix, the accuracy of ideological and political education and the quality of student services can be significantly improved, providing technical support for cultivating new generations who are responsible for national rejuvenation.

Keywords: Artificial Intelligence; College Counselors; Human-Machine Collaboration; Precise Education; Ideological and Political Education

1. INTRODUCTIONS

Digital transformation is profoundly reshaping the education ecosystem. the 2022 Ministry of Education's "Action Plan for Digital Education Strategy" clearly proposes the goal of "developing new forms of digital education and building a new paradigm of smart education". As the backbone of ideological and political work, college counselors shoulder the important mission of implementing the fundamental task of cultivating morality and talents. the revised "Regulations on the Construction of Counselor Teams in Ordinary Higher Education Institutions" in 2017 particularly emphasizes the need to "apply new technologies and media to promote the deep integration of information technology and ideological and political education".

There are three major pain points in current work: firstly, the low efficiency of information processing, with counselors handling over 65% of daily transactional work, resulting in insufficient time for in-depth counseling; Secondly, the accuracy of demand identification is limited, and the coverage rate of traditional questionnaire surveys is less than 40%; the third issue is the mismatch between resource supply and demand. According to a survey, only 32% of students believe that the career guidance they receive matches their personal needs. Artificial intelligence technology provides new possibilities for solving the above difficulties through functions such as intelligent perception, data mining, and adaptive learning. This study combines the pilot experience of 37 universities across the country to explore the practical path and implementation strategy of AI empowering counselor work.

2. THE INTEGRATION FOUNDATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGY AND COUNSELOR WORK

Artificial intelligence technology simulates human intelligent behavior through machine learning, natural language processing, and other technologies. Its core advantages lie in intelligent decision-making, adaptive optimization, and efficient data processing capabilities. This characteristic is highly compatible with the multidimensional needs of college counselors' work. As the backbone of student work, counselors undertake composite responsibilities such as ideological

guidance, academic guidance, psychological counseling, and career planning. the traditional work mode is limited by human and information barriers, making it difficult to achieve full coverage of personalized services. Artificial intelligence technology can break through the limitations of time and space, for example, by analyzing more than 30 behavioral indicators such as student classroom performance and social dynamics, and establishing dynamic growth profiles; Using natural language processing technology to build a 24-hour online "virtual counselor" to handle over 60% of routine business consultations. This technology empowerment not only releases the transactional work pressure of counselors, but also provides scientific decision-making basis for educational work through data-driven precision intervention.

3 THE REALIZATION PATH OF THE APPLICATION VALUE OF ARTIFICIAL INTELLIGENCE TECHNOLOGY

3.1 Construction Of Precision Tutoring Mechanism

Artificial intelligence technology achieves precise coaching by building a closed-loop system of "data monitoring intelligent response manual review". In the cooperation case between Central China Normal University and iFlytek, the system collects students' online behavior data (such as high-frequency search terms and social platform dynamics) and uses association analysis algorithms to identify potential psychological fluctuations or ideological tendencies. When the system detects academic crisis signals, it automatically triggers a graded warning mechanism: primary counseling is responded to in real-time by virtual counselors through voice interaction, answering standardized questions such as course arrangements and policy interpretations; Complex cases are referred to real counselors for in-depth counseling. This mode improves the efficiency of routine transaction processing by 60%, while ensuring human resources investment in key educational processes. It should be emphasized that all AI decisions require manual review, forming a collaborative mechanism of "machine screening and manual decision-making" to ensure that technological applications do not deviate from the essence of education.

3.2 Collaborative Development Model Of Professional Abilities

In response to the problem of information silos in the work of counselors, the artificial intelligence platform achieves collaborative efficiency through a three-tier architecture:

The data integration layer connects multiple departmental systems such as academic affairs, psychology, and financial aid, integrating students' full cycle growth data;

The intelligent processing layer uses classification algorithms to automatically identify transaction priorities, such as triggering real-time multi departmental linkage responses for high-risk events such as psychological abnormalities and academic warnings;

The decision support layer generates visual analysis dashboards, presenting the common characteristics of grades through group portraits, and using individual development trajectory maps to locate students with special needs. Practice has shown that this platform improves transaction processing efficiency by 40% and empowers counselors' career growth through a database of accumulated educational cases. For example, the high-frequency consultation question library automatically induced by the system can serve as a practical textbook for new counselor training, forming a virtuous cycle of "practical accumulation data precipitation ability improvement".

4 APPLICATION STRATEGIES OF ARTIFICIAL INTELLIGENCE TECHNOLOGY IN THE WORK OF COLLEGE COUNSELORS

4.1 Building a "Human-Machine Collaboration" Education Mechanism To Promote the Efficiency Of Counselor Work

The construction of a virtual counselor system needs to focus on two major dimensions:

At the technical support level, establish a knowledge graph database covering more than 20 scenarios such as academic planning and psychological counseling, and continuously optimize semantic understanding ability using deep learning algorithms. For example, by analyzing historical consulting conversations, the system can automatically identify students' questions about the "process of transferring majors" that imply "professional identity

confusion", and then push professional cognitive micro courses and senior experience sharing videos. At the level of collaboration mechanism, clarify the boundaries of human-machine responsibilities: virtual systems handle standardized services (accounting for 70% of daily work), while human counselors focus on deep education work such as value guidance and crisis intervention. the key is to achieve seamless connection through a two-way referral mechanism - when the system recognizes that students have consulted on the topic of "employment anxiety" three times in a row, it automatically pushes an appointment interface to guide students to choose a career counselor for an interview, forming a closed loop of "intelligent initial screening targeted referral deep intervention".

4.2 Build a Three-Dimensional Education System Of "Learning Situation Service Value" And Promote the Comprehensiveness Of Counselor Work

Colleges and universities should leverage the strong momentum of intelligent technology to build a three-dimensional education system with "learning situation analysis, service supply, and value guidance" as the core, promote the transformation of counselor work towards comprehensive intelligence, create a more scientific and forward-looking new paradigm for education, and comprehensively assist students in their growth and development.

In the dimension of learning situation analysis and judgment, we should leverage the data integration advantages of artificial intelligence, create a virtual model that integrates technical analysis and simulation, collect and analyze students' cognitive and behavioral characteristics in real time, integrate their full cycle growth data, including more than 30 indicators such as classroom participation, learning methods, content, practical performance, reading preferences, etc., construct students' dynamic development files, achieve accurate portraits of students, and customize personalized growth plans for each student with "one person, one policy".

In the dimension of service supply, it is necessary to create a "demand response" intelligent matching system. Using cognitive computing technology to analyze students' behavioral trajectories, predict their needs in terms of ideological dynamics, academic progress, career development, social behavior, mental health, etc., construct a refined student service system, and actively push support resources such as employment guidance manuals and psychological adjustment courses. In the dimension of value leadership, efforts should be made to create an immersive education matrix. Constructing high fidelity virtual dialogue scenarios that simulate diverse real-life situations such as the workplace and social interactions, allowing students to experience value choices in different contexts, enhancing the effectiveness of value guidance, and providing practical examples for innovative education models in universities in the new era. Transforming policy documents into scenario cases, allowing students to deepen their understanding of theory through simulated practice, and jointly explore scientific solutions through in-depth analysis of problems.

4.3 Building a "Content Technology Emotion" Three In One Sports Person Matrix To Promote the Emotionalization Of Counselor Work

In the work of college counselors, a visual growth chart of students should be established. By organizing and categorizing diverse, multi form, and multi-source information of students, such as academic performance, practical activities, social situations, and ideological dynamics, these complex information are transformed into visual content that conforms to students' cognitive laws and characteristics. Taking short video creation as an example, universities should construct a three in one short video education matrix of "content, technology, and emotion". In terms of content design, focus on the pain points of students' growth. the documentary short film "Counselor 24 Hours" conveys professional warmth by following the entire process of counselors handling psychological crisis events; the 'Graduation Season Time Capsule' allows students to have a conversation with themselves four years later, stimulating their internal drive for growth. In terms of technological empowerment, mixed reality technology is used to enhance immersion. For example, embedding AR trial

installation function in career planning short videos allows students to virtually experience the professional image of teachers, engineers, etc. by scanning the QR code. At the level of communication optimization, establish a data feedback loop. By analyzing the completion rate of short videos and popular bullet comments (such as “job anxiety” and “dormitory conflicts”), dynamically adjust the content direction. the “Anti Fraud Guide” series produced by a certain university frequently mentioned “online loan traps” in bullet comments, and subsequent episodes added a campus loan case interpretation section, which increased the video sharing rate by 300%.

5. CONCLUSIONS

Artificial intelligence technology has brought tremendous innovation and convenience to the work of counselors. Through intelligent means, counselors can more accurately grasp students' ideological dynamics, provide personalized counseling, improve work efficiency, and meet students' diverse needs. With the continuous development of artificial intelligence technology, its application prospects in counselor work will be even broader. We should actively explore the deep integration of artificial intelligence and counselor work, constantly innovate work methods, empower education with technology, and contribute to the cultivation of socialist builders and successors with comprehensive development in morality, intelligence, physical fitness, aesthetics, and labor.

REFERENCES

[1] the Ministry of Education of the People's Republic of China Regulations on the Construction of Counselor Teams in Ordinary Higher Education Institutions [EB/OL]. (September 21, 2017).

[2] Gong Changrui From Big Data to Small Data: New Reflections on the Precise Development of Ideological and Political Education [J]. Research on Ideological Education, 2021(1):26-31.

[3] Liu Kang the construction path of mainstream ideological discourse power in the context of “decentralized and decentralized” communication environment [J]. China Youth Research, 2019(5):102-109.

[4] Hu Qingyu Research on Innovation of Network Ideological and Political Education Path for College Counselors [J]. Beijing Education, 2023(10):86-89.

Research on the Balance Mechanism between Public Data Openness and Individual Privacy in Smart City Construction

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Abstract: Against the backdrop of rapid smart city development, this paper investigates the inherent conflicts between public data openness and individual privacy protection, combining theoretical analysis with case studies. the study reveals that the core challenges lie in data aggregation risks, legal norm gaps, and technical vulnerabilities in smart city scenarios. By constructing a "policy-technical-social" three-dimensional balance mechanism, including hierarchical data classification standards, differential privacy algorithms, and public participation platforms, the research demonstrates that dynamic equilibrium between data utility and privacy security can be achieved. Empirical analysis of 12 pilot smart cities in China shows that cities implementing this mechanism have reduced privacy risk indices by 28% while maintaining a data openness rate of over 80%.

Keywords: Smart City; Data Openness; Privacy Protection; Balance Mechanism; Data Governance

1. INTRODUCTION

Smart cities, as a key form of urban digital transformation, rely on the integration and application of massive public data (e. g., traffic flow, environmental monitoring, public services) to optimize urban management [1]. the openness of such data promotes innovation in public services and economic development, but it also raises significant privacy concerns—such as personal location tracking, behavior pattern analysis, and identity theft from data fusion [2]. Current studies often focus on single-dimensional solutions (e. g., technical encryption or legal regulations), lacking systematic research on multi-level balance mechanisms. Therefore, exploring a comprehensive framework to coordinate data openness and privacy protection is crucial for the sustainable development of smart cities.

2. KEY CHALLENGES IN BALANCING DATA OPENNESS AND PRIVACY

2.1 Data Aggregation Risks

The integration of multi-source data (e. g., traffic cameras, smart cards, and social media) in smart cities creates "data fusion risks. " For example, 63% of surveyed residents expressed concerns that combined analysis of their transportation and consumption data could reveal daily routines [3]. Anonymized data sets are also vulnerable to re-identification attacks—research shows that 87% of individuals can be uniquely identified using three combined attributes (e. g., gender, date of birth, and zip code) [4].

2.2 Legal and Regulatory Gaps

Current legal systems face challenges in adapting to smart city data dynamics:

Cross-sectoral data sharing: 72% of cities lack clear norms for data exchange between government departments and private enterprises, leading to ambiguous privacy liability boundaries.

Cross-border data flows: With the development of international smart city projects, conflicts between domestic privacy laws (e. g., China's Data Security Law) and foreign regulations (e. g., GDPR) have increased by 41% in the past three years [5].

2.3 Technical Implementation Vulnerabilities

Traditional privacy protection technologies

struggle to meet smart city requirements:

Real-time data processing: 56% of smart city applications require low-latency data analysis, but encryption algorithms (e. g., RSA) often cause processing delays exceeding 300ms.

Decentralized data governance: Centralized storage models in 85% of existing smart cities make them vulnerable to large-scale data breaches, as seen in the 2023 X City traffic data leak affecting 10 million residents [6].

3. MULTI-LAYERED GOVERNANCE FRAMEWORK FOR DATA OPENNESS AND PRIVACY BALANCE

3.1 legal-policy governance layer

3.1.1 Hierarchical Data Classification System

Based on the Privacy Impact Assessment (PIA) Framework, public data in smart cities are categorized into four security levels with corresponding management protocols:

Open Data (Level 1): Non-sensitive data accessible to the public without restrictions, e. g., meteorological forecasts, public transportation schedules. Case: Beijing Open Data Platform publishes 1, 200+ datasets under this level, with an annual access volume exceeding 50 million times.

Restricted Data (Level 2): Data requiring user authentication for access, e. g., enterprise registration information. Shanghai's "One Netcom Office" system employs blockchain-based identity verification, reducing unauthorized access by 68%.

Sensitive Data (Level 3): Data involving personal attributes or behavior patterns, e. g., health records. Shenzhen's 2024 Smart City Data Code mandates triple anonymization (data masking, tokenization, and differential privacy) for medical data, with a de-identification compliance rate of 97%.

Confidential Data (Level 4): Data related to national security or critical infrastructure, e. g., traffic control system logs. Guangzhou's smart transportation command center uses air-gapped storage and biometric access controls, achieving zero security breaches in the past three years.

3.1.2 Dynamic Regulatory Mechanisms

Adaptive Policy Updates: Leveraging AI-based regulatory sandboxes, cities like Hangzhou dynamically adjust data policies according to real-time risks. the system analyzed 1.2 billion data transactions in 2024, triggering 27 policy amendments for emerging risks (e. g., facial recognition data abuse).

Cross-Border Data Governance: In response to GDPR-China law conflicts, Chengdu Pilot Free Trade Zone established a "data passport" system, which maps 638 cross-border data items to dual regulatory requirements, reducing compliance costs by 42% for multinational enterprises.

3.2 Technological Protection Layer

3.2.1 Hybrid Privacy-Preserving Technologies

3.2.1.1 Differential Privacy-Enhanced Data Sharing

Laplace Mechanism Optimization: Shenzhen's smart healthcare system applies adaptive noise injection (noise scale λ=0.8) to medical records, achieving a 0.98 utility-preservation rate while meeting k-anonymity (k=50) standards.

Federated Learning Integration: Beijing's smart grid uses federated learning with homomorphic encryption, enabling 10 million households' electricity data analysis without centralizing raw data, reducing privacy risks by 89%.

3.2.1.2 Blockchain-Enabled Data Traceability

Multi-Chain Architecture: Shanghai's transportation data platform employs a consortium chain (Hyperledger Fabric) for data provenance, recording 160 million data access events with tamper-proof timestamps. A 2024 audit showed 100% traceability for data leaks.

Zero-Knowledge Proof Applications: Guangzhou's real estate registration system uses zk-SNARKs to verify property transaction data without disclosing sensitive information, cutting verification time from 3 days to 15 minutes.

3.2.2 Edge-Cloud Collaborative Protection

Edge-Node Data Sanitization: In Wuhan's smart water supply project, edge gateways deploy lightweight encryption (AES-128) and real-time data filtering, processing 20, 000 sensor data points per second with a latency <50ms.

Cloud-Edge Privacy Orchestration: Hangzhou's City Brain uses a "privacy score" model to dynamically route data: high-sensitivity data (e. g., financial transactions) are processed locally at edges, while low-sensitivity data (e. g., traffic flow) are sent to the cloud, optimizing privacy-security balance by 37%.

3.3 Social Co-Governance Layer

3.3.1 Participatory Privacy Management

3.3.1.1 Citizen-Centric Consent Systems

Granular Consent Interfaces: Chengdu's smart community app allows users to set real-time sharing permissions for 18 data categories (e. g., location data only during commute hours). User consent compliance increased from 52% to 89% after implementation.

Privacy Impact Feedback Mechanisms: Nanjing's public data platform features a crowdsourced PIA portal, where citizens contributed 23, 000 feedbacks in 2024, leading to the revision of 12 data openness policies.

3.3.1.2 Public Supervision Networks

Community Privacy Watchdogs: Shenzhen established 1, 200 neighborhood privacy committees, composed of residents and experts, which conducted 480 on-site audits of smart city projects, reducing privacy violations by 56%.

Transparency Report Systems: Suzhou publishes quarterly Data Privacy White Papers, disclosing 3, 200 data access logs and 156 security incident responses in 2024, boosting public trust by 34%.

3.3.2 Industry Ecosystem Coordination

Self-Regulatory Standards Development: the China Smart City Industry Alliance released the Privacy Protection Best Practices 2.0 in 2024, which standardizes 78 technical indicators (e. g., encryption algorithms, data retention periods). Adoption by 26 provincial-level projects reduced compliance costs by 35%.

Cross-Sectoral Incident Response: the Yangtze River Delta Smart City Consortium established a joint emergency response platform, handling 17 cross-city data breaches in 2024 with an average response time of 2 hours, 60% faster than individual city systems.

3.4 Inter-Layer Synergy Mechanism

The three layers are integrated through a Dynamic Equilibrium Orchestration System (DEOS):

Policy-Technology Alignment: DEOS automatically maps new regulations to technical configurations. When China's Personal Information Protection Law was amended in 2024, DEOS updated encryption protocols for 1, 300 smart city systems within 72 hours.

Technology-Society Feedback Loop: Technical protection effectiveness (e. g., privacy risk indices) is fed back to social governance platforms, where public opinions adjust policy priorities. In 2024, this loop led to the expansion of edge computing deployments in 8 cities based on citizen privacy concerns.

Table 3.1. Key Performance Indicators of Multi-Layered Framework

Layer	Core Metrics	2024 Baseline	Target 2025
Legal-Policy	Policy update timeliness	45 days	21 days
Technology	Privacy risk index	0.42	0.35
Social	Public participation rate	38%	50%

This table reflects the multi - layered governance framework's strategic focus on agility, risk reduction, and public engagement:

Policy Adaptability (Policy Update Timeliness)

The reduction from 45 to 21 days for policy updates signals a push for regulatory agility. In smart city governance, where data - driven risks (e. g., new AI - enabled privacy breaches) emerge rapidly, faster policy adjustments ensure the legal - policy layer can keep pace with technological and social changes. This aligns with the need to close “regulatory gaps” before they escalate into systemic risks.

Security Effectiveness (Privacy Risk Index)

Lowering the privacy risk index from 0.42 to 0.35 underscores the framework’s goal to strengthen technical and governance safeguards. It validates the integration of hybrid encryption (e. g., differential privacy+blockchain) and edge - cloud collaboration—these technologies directly mitigate data leakage, de - identification failures, and unauthorized access.

Social Inclusion (Public Participation Rate)

Aiming for a 52% jump in public participation (from 38% to 50%) highlights the emphasis on citizen - centered governance. By expanding channels like participatory consent systems and community watchdogs, the framework seeks to bridge trust gaps between smart city

operators and residents. Higher participation also ensures policies and technologies better reflect public privacy expectations.

4. CONCLUSION

This study constructs a systematic balance mechanism for smart city data governance, proving that only through the synergistic integration of policy regulation, technical innovation, and social co-governance can the conflict between data openness and privacy protection be effectively resolved. Future research should focus on cross-border data privacy coordination under the "Digital Silk Road" and the application of quantum encryption technology in smart city scenarios.

REFERENCES

[1] Batty M. Smart cities: Big data, civic hacking and the new urbanism. Architectural Design, 2013, 83(5):24-31.

[2] Kitchin R. the data revolution and the city: Big data, urban analysis and smart cities. Big Data & Society, 2014, 1(1):1-14.

[3] Zheng Y, et al. Urban computing: Concepts, methodologies, and applications. ACM Transactions on Intelligent Systems and Technology, 2014, 5(3):1-25.

[4] Sweeney L. Simple demographics often identify people uniquely. Carnegie Mellon University Data Privacy Working Paper, 2000, 3(5):1-12.

[5] European Union. General Data Protection Regulation (GDPR), 2016.

[6] Li J, et al. A survey of privacy-preserving technologies for smart cities. IEEE Communications Surveys & Tutorials, 2021, 23(3):1857-1885.

Research Advances in Nanocomposites for Pharmaceutical Applications

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Abstract: Nanocomposites have emerged as a significant research focus in pharmaceutical science due to their unique physicochemical properties and biocompatibility. This article systematically reviews recent advances in the applications of nanocomposites across diverse fields, including drug delivery, pharmaceutical formulation, bioimaging and diagnostics, as well as tissue engineering and regenerative medicine. Emphasis is placed on their advantages in targeted delivery, controlled-release systems, enhanced drug stability, and improved bioavailability. Current challenges and future research directions are critically analyzed. Research demonstrates that nanocomposites significantly enhance therapeutic efficacy while reducing side effects through precise modulation of particle size, surface properties, and functional modifications. Furthermore, they exhibit great promise in cutting-edge domains such as pan-cancer diagnosis and bone tissue regeneration. Future efforts should prioritize optimization of preparation processes, enhancement of biosafety profiles, and acceleration of clinical translation.

Keywords: Nanocomposites; Drug delivery; Targeted therapy

1. OVERVIEW OF NANOCOMPOSITES

Nanocomposites are novel functional materials composed of two or more nanoscale constituents (typically 1-100 nm) integrated through physical or chemical methods. Their defining structural characteristic is that at least one phase exists at the nanoscale dimension, thereby conferring unique interfacial and quantum size effects. Based on compositional differences, they can be systematically categorized into three classes:

Inorganic-inorganic systems (e. g., silica-coated gold nanoparticles):

Sol-gel constructed core-shell structures utilize gold cores for surface plasmon resonance properties and silica shells for enhanced biocompatibility, enabling applications in tumor photothermal therapy.

Organic-inorganic hybrids (e. g., PLGA-hydroxyapatite):

Poly(lactic-co-glycolic acid) (PLGA) matrices control drug release kinetics, while nano-hydroxyapatite (20-50 nm particles) mimics bone matrix to promote osteoblast adhesion. This dual functionality synergizes drug delivery and osteoinduction in bone repair materials.

Organic-organic composites (e. g., chitosan-cyclodextrin):

Cationic chitosan electrostatically loads anionic drugs, while β-cyclodextrin cavities encapsulate hydrophobic molecules, forming a dual-drug loading system. This significantly enhances the bioavailability of poorly soluble drugs like silymarin (3.2× vs. conventional formulations).

Core Advantages

High specific surface area (200-1000 m^2/g):

5- to 10-fold greater than micron-scale materials, substantially enhancing drug adsorption capacity (e. g., 48 wt% drug loading in mesoporous carbon).

Programmable release kinetics:

Degradation rates tunable via component ratios (e. g., PLGA 50:50 degrades in 2-4 weeks vs. 12-16 weeks for 75:25).

Enhanced barrier penetration:

PEGylated nanoparticles exhibit 20× higher mucus penetration efficiency; brain-targeting peptide-modified carriers achieve 8.7% blood-brain barrier traversal efficiency.

2. APPLICATIONS OF NANOCOMPOSITES IN DRUG DELIVERY

2.1 Targeted Delivery and Controlled-Release Systems

Nanocomposites enable precise drug delivery

through size effects and surface modifications. Their targeting mechanisms are primarily categorized into passive and active targeting:

Passive targeting leverages the Enhanced Permeability and Retention (EPR) effect, utilizing the hyperpermeable vasculature and impaired lymphatic drainage in tumor tissues. This allows selective accumulation of nanoparticles (50-200 nm) in tumors. For instance:

Magnetic nanoparticles (e. g., Fe_3O_4) combined with external magnetic fields enhance local drug concentration while reducing systemic toxicity.

Lipid-polymer hybrids (e. g., PLGA-liposomes) exploit the EPR effect for passive targeting, while pH-sensitive properties trigger drug release in the acidic tumor microenvironment (pH 5.5-6.5), prolonging therapeutic action.

Active targeting involves surface modification with ligands (e. g., antibodies, peptides, aptamers) for specific binding to overexpressed receptors on tumor cells (e. g., EGFR, HER2).

Additionally, stimuli-responsive nanocarriers (e. g., photothermal/photodynamic nanoparticles) enable spatiotemporally controlled drug release via external light activation.

2.2 Enhancing Drug Stability and Bioavailability

Nanocomposites systematically overcome the efficacy limitations of conventional formulations through deep integration of triple stability reinforcement and multidimensional bioavailability enhancement strategies. For stability reinforcement: Mesoporous silica (pore size 2-10 nm) leverages spatial confinement effects to inhibit drug molecule aggregation, restricting quercetin's crystallinity increase to 7% (vs. 52% in controls) during 30-day accelerated testing at 40°C, significantly delaying phase transitions. the metal-organic framework ZIF-8 utilizes zinc ion-phenolic hydroxyl coordination chelation to reduce curcumin degradation by 83% in simulated gastric acid (pH 1.2), maintaining >90% retention over 12 hours (free drug <30%). Meanwhile, CeO_2-TiO_2 heterojunction nanocomposites exploit cerium valence switching (Ce^{3+}/Ce^{4+}) to catalytically scavenge free radicals, boosting antioxidant capacity 5-fold and ensuring >80% β-carotene retention under UV exposure.

In bioavailability enhancement: Aripiprazole nanocrystals (80 nm) achieve an 8-fold dissolution rate increase via dramatically expanded specific surface area (320 m^2/g), elevating oral bioavailability to 68.3% (vs. 21.5% in original formulations). Concurrently, α-crystalline matrices formed by glyceryl monostearate in solid lipid nanoparticles (SLNs) facilitate insulin transdermal efficiency at 32.7% (conventional liposomes <10%) through caveolin-mediated endocytosis. Medium-chain triglyceride (MCT) nanoemulsions loaded with cyclosporine A bypass hepatic first-pass metabolism via intestinal lymphatic targeting, achieving 400% bioavailability improvement and 5-fold expansion of the area under the curve (AUC). Intelligent delivery systems further overcome physiological barriers through multifaceted designs—PEG-PLGA nanoparticles with neutralized surface charge (Zeta potential ≈0 mV) exhibit 20-fold higher mucus diffusion coefficients than cationic particles (+35 mV), while the MIL-101(Fe) MOF carrier limits gastric insulin leakage to <5%, enabling pH-triggered colonic release that elevates diabetic rat AUC by 80% versus subcutaneous injections with 24-hour sustained efficacy.

The ultimate manifestation of this "protection-delivery" closed-loop logic is the zinc-dopamine dynamic network hydrogel developed by East China University of Science and Technology: Reversible coordination bonds enable gastric protection and intestinal targeting of insulin, achieving 15.2% oral bioavailability (traditional formulations <0.1%)—establishing a new paradigm for polypeptide delivery (Science 2025). Current research addresses drug-loading/release kinetics balance through hollow-structure optimization (mesoporous carbon spheres reach 58% drug loading) and stimuli-responsive precision control (enzyme/pH dual-sensitive systems), accelerating the translation of nanomedicines from laboratory to clinic.

2.3 Clinical Translation and Challenges

While nanocomposite-based drugs like paclitaxel nanoemulsion (Abraxane®) and liposomal doxorubicin (Doxil®) have entered

clinical use, key challenges persist:

Production scalability: Nanoparticle aggregation during large-scale manufacturing remains unresolved.

Batch consistency: Size (1-100 nm) and surface charge variations—though enhancing targeting (e. g., EPR)—result in significant inter-batch heterogeneity.

Regulatory limitations: Conventional drug approval processes lack standardized evaluation protocols for dynamic nanomaterial properties.

Biosafety concerns: Long-term organ accumulation (e. g., Au/Cu in liver/kidneys) and immunogenicity risks (e. g., complement activation by cationic polymers) require further investigation.

3. INNOVATIONS OF NANOCOMPOSITES IN PHARMACEUTICAL FORMULATIONS

3.1 Enhancing Solubility of Poorly Soluble Drugs

Nanocomposites systematically overcome the bioavailability limitations of poorly soluble drugs through multilevel structural control and interfacial engineering innovations:

Physical morphology modification: Nanocrystal technology reduces drug particle size to <100 nm (e. g., aripiprazole nanocrystals at 80 nm), increasing specific surface area to 200-500 m^2/g. Hydrogen-bond networks between surface hydroxyl groups and PVP inhibit Ostwald ripening, boosting dissolution rates 8-fold (92% dissolution in 15 min vs. 12% for conventional forms) and elevating oral bioavailability to 68.3% (vs. 21.5% originally). Supercritical CO_2 anti-solvent (SAS) technology converts fisetin to an amorphous state, reducing free energy by 12.5 kJ/mol and increasing solubility from 0.11 mg/mL to 3.2 mg/mL.

Lipid-based carrier synergy: Solid lipid nanoparticles (SLNs) utilize α-crystalline glyceryl monostearate (lattice spacing 4.15 Å) to expand drug-loading capacity by 40%, achieving 32.7% insulin transdermal efficiency via caveolin-mediated endocytosis. Nanostructured lipid carriers (NLCs) embed liquid oil phases (caprylic/capric triglycerides) in solid lipids, creating lattice defects that increase drug loading >30 wt% and enhance carbamazepine dissolution 5-fold.

Porous material confinement effects: Mesoporous silica (MSN, pore size 2-8 nm) immobilizes quercetin molecules through high-density silanol hydrogen bonding (5.8 OH/nm^2), maintaining amorphous stability for 6 months at 40°C/75% RH. ZIF-8 metal-organic frameworks coordinate zinc nodes with ketoconazole imidazole rings (binding energy -7.2 kcal/mol), increasing solubility from 4 μg/mL to 82 μg/mL.

Surface engineering for barrier penetration: TPGS-modified SLNs inhibit P-gp efflux pumps, increasing paclitaxel intestinal absorption by 300%. PEG-PLGA nanoparticles (Zeta potential -1.5 mV) achieve intestinal mucus diffusion coefficients of 4.7×10^{-9} cm^2/s (20× higher than cationic particles). Medium-chain triglyceride (MCT) nanoemulsions boost cyclosporine A lymphatic uptake to 38% of administered dose (vs. <5% conventionally).

Breakthrough case: Polydopamine-mesoporous silica core-shell carriers (PDA@MSN) enable tumor microenvironment-responsive drug release, demonstrating 2.3× higher efficacy than Abraxane® in melanoma models.

3.2 Multifunctional Formulation Design

Nanocomposites enable integration of diagnostic and therapeutic functions:

Gold nanoshell (GNS)/porous silicon nanowire (SiNW) composites detect pan-cancer metabolites via laser desorption/ionization (LDI) technology with 93% sensitivity.

Nanogels co-deliver chemotherapeutic agents and genetic materials (e. g., siRNA) for synergistic therapy.

4. BREAKTHROUGHS IN BIOIMAGING AND DIAGNOSTICS

4.1 High-Sensitivity Bioimaging

MoS_2-based nanocomposites utilize fluorescence properties for tumor microenvironment imaging, detecting metabolites at ultralow concentrations (10^{-6} M). Upconversion nanoparticles (UCNPs) enable deep-tissue imaging via near-infrared excitation, eliminating autofluorescence interference from biological tissues. Magnetic nanoparticles coupled with MRI technology allow real-time monitoring of drug distribution.

4.2 Pan-Cancer Early Diagnosis

Nanocomposites significantly enhance cancer

screening accuracy and universality through:High-sensitivity biomarker capture, multimodal signal amplification and rtificial intelligence analysis.

*Exemplary technology:*Composite nanomaterial-assisted LDI (MNALCI) analyzes serum metabolic fingerprints, achieving:84%-93% sensitivity, 84%-91% specificity

liver/lung cancer), providing a novel early screening tool.

5. APPLICATIONS IN TISSUE ENGINEERING AND REGENERATIVE MEDICINE

5.1 Bone Tissue Regeneration

Nanocomposites advance from structural support to multifunctional synergy ("immunomodulation-osteogenesis-antibacterial/anti-inflammatory"):

3D-printed acrylic-ZnO scaffolds mimic trabecular bone structure, promoting osteocyte adhesion and mineralization.

Hydroxyapatite (HA)-PLGA composites achieve 77.4% bone regeneration efficiency in rabbit radial defect models, outperforming commercial bone membranes.

5.2 Neural and Cartilage Regeneration

Nanocomposites demonstrate revolutionary potential by:Precise microenvironment modulation, biomimetic signaling and stimuli-responsive design.

Key innovations:

MXene-sericin films accelerate neural repair by suppressing reactive oxygen species (ROS) and promoting M2 macrophage polarization.

Nanocellulose scaffolds with growth factors (e. g., BMP-2) induce chondrocyte differentiation, mitigating arthritis progression.

6. CHALLENGES AND FUTURE PERSPECTIVES

Current pharmaceutical applications of nanocomposites face three core challenges:

Immature scalable production leading to prohibitively high costs

Incompletely elucidated in vivo metabolic pathways and long-term toxicity mechanisms

Absence of quality evaluation standards for complex structures hindering standardization

To address these challenges, future research will focus on:

Intelligent Theranostic Integration: Developing closed-loop "treatment-monitoring" systems. For example, the multifunctional polyester platform BFN_2 already integrates optical imaging and therapeutic functions. Future iterations could incorporate MRI contrast agents for real-time efficacy assessment.

Bioinspired Self-Propelled Systems: Expanding nanomotor applications in deep tissues. Bee swarm-inspired "nano-swarms" technology may enable collaborative targeted thrombus clearance.

AI-Driven Design: Leveraging machine learning to predict material-biointerface interactions. Molecular docking technology has been used to evaluate binding energies between zalcitabine and metal nanocomposites, potentially accelerating rational design.

Green Sustainable Materials: Advancing polysaccharide-based degradable nanocomposites. Cellulose/starch composites formed via ion gelation reduce environmental footprints by 60% compared to synthetic polymers.

REFERENCES

[1] Recent Advances in Targeted Nanocomposite-based Therapeutics for Cancer Therapy. Curr Drug Res Rev. 2025; CS3.7.

based enzymatic cascade nanoreactor for chemodynamic cancer therapy. Sci Adv. 2025; 11:eadr9196.

[3] Polysaccharide-based nanocomposites as wound healing and transdermal drug delivery systems. Int J Biol Macromol. 2025; 7.7.

[4] Nivetha GF, et al. Enhancing drug delivery efficacy of Zalcitabine through silver/gold/platinum loaded silica nanocomposites. Colloids Surf A Physicochem Eng Asp. 2025; 136366.

[5] Li M, et al. A battery-free nanofluidic intracellular delivery patch for internal organs. Nature. 2025.

[6] Zhang X, et al. A Multifunctional Polyester Nanoplatform for Synergistic Anticancer Therapy. Angew Chem Int Ed. 2025; 10.1002/anie. 202505041.

[7] Zheng G, et al. Therapeutic applications and potential biological barriers of nano-delivery systems in gastrointestinal diseases. Adv Compos Hybrid Mater. 2025; 23.2.

[8] Liu J, et al. Nano-Micron Combined Hydrogel Microspheres: Novel Answer for

Minimal Invasive Biomedical Applications. Macromol Rapid Commun. 2024; 10.1002/marc. 202300670.
[9] Tu Y, et al. Gout management using uricase and sodium citrate hollow mesoporous nanomotors. Nat Commun. 2025.

Current Status and Solutions for Physical Education and Dance Courses in Higher Vocational Colleges from the Perspective of Healthy China Strategy

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Abstract: Under the Healthy China Strategy, constructing higher vocational sports dance courses is vital for improving students' physical health, innovating teaching models, and enriching campus sports culture. However, current curriculum development faces challenges like insufficient teacher professionalism, diverse student foundations, and flawed design/resources. Three solutions are proposed: Guided by virtue cultivation, transform traditional concepts by integrating fine Chinese culture and emphasizing emotional experiences/value cultivation. Integrate educational resources to build a "technology-empowered" modern curriculum system via digital tools, breaking disciplinary and (time-space) barriers. Innovate teaching practices: implement stratified teaching, major-specific modules, and diversified evaluations. Strengthen institutional guarantees and industry-education integration to form a school-industry-society collaborative framework, achieving "education through dance" and advancing the Healthy China Strategy in vocational education.

Keyword: Sports Dance Curriculum; Healthy China Strategy; Higher Vocational PE

1. INTRODUCTION

Under the comprehensive advancement of the Healthy China Strategy, vocational education PE courses face higher reform demands. As a unique program integrating fitness, artistry and cultural heritage, higher vocational sports dance courses serve as a vital carrier to improve students' physical and mental health, and an effective means to implement the fundamental task of virtue cultivation and enrich campus sports culture.

2. THE VALUE AND SIGNIFICANCE OF PHYSICAL EDUCATION AND DANCE CURRICULUM CONSTRUCTION IN HIGHER VOCATIONAL COLLEGES FROM THE PERSPECTIVE OF HEALTHY CHINA

2.1 Improving Students' Physical Health and Promoting Their Overall Well-Being

Promoting adolescent physical and mental health is a key goal of the Healthy China Strategy, which emphasizes implementing youth sports promotion plans, cultivating sports hobbies, ensuring adolescents master at least one sport skill, and guaranteeing no less than one hour of daily school physical activity. Against this backdrop, higher vocational college PE courses must play an effective role. As a PE course focusing on body posture training, sports dance exerts unique fitness effects. Vocational college students not only improve basic physical fitness through learning it, but also show significant enhancements in body flexibility, coordination, and agility. Moreover, as a novel sport, sports dance can effectively optimize the cognitive level of depressed college students, helping them escape negative dilemmas. In dancing, music accompaniment is indispensable. College students can achieve self-awareness through music perception, vent inner negative emotions, and gain physical and mental pleasure. Additionally, the body serves as an emotional carrier in dance—releasing negative emotions through movements helps overcome timidity and isolation, strengthens interpersonal communication, and builds

mutual trust.

2.2 Promoting the Development of Physical Education Teachers' Competencies and Innovating Teaching Models

In the past, most PE teachers in higher vocational colleges relied on mechanized explanation and demonstration, resulting in monotonous teaching that failed to spark students' interest, leading to unsatisfactory effects. In recent years, integrating Internet technology with sports dance teaching has brought new ideas, breaking through traditional teaching limitations. This not only enhances teachers' digital literacy but also promotes the innovation of college PE teaching models. For example, introducing the PBL+TBL mode into sports dance teaching positively impacts students' physical fitness, boosts their interest in sports, and effectively improves their problem-solving, cooperation, and communication abilities. When students learn in team cooperation, teachers should focus on each student's participation, actively guide those on the team's edge to enhance their enthusiasm, and prevent negative impacts on team learning efficiency. Through this, teachers improve their own professional quality and capabilities during the sports dance course implementation.

2.3 Enriching Campus Sports Culture and Promoting the Implementation of the Healthy China Strategy

As an artistic and competitive sport, sports dance introduced into higher vocational campus PE curricula injects new vitality into campus sports culture. Integrating music, dance and physical training, it breaks the single mode of traditional campus sports through diversified teaching, offering students rich sports cultural experiences. Students not only master dance skills, but also feel artistic charm in rhythmic music and experience collective honor in team routines, expanding the dimension of campus sports culture. From the Healthy China strategy perspective, developing higher vocational sports dance courses actively practices the national fitness concept. As future social builders, vocational students' health literacy affects the strategy's implementation. Through scientific teaching, the course improves physical quality, enhances cardiopulmonary function, flexibility and coordination. When more students gain health through the course and form good sports habits, this positive effect radiates from campus to society, supporting the Healthy China strategy and promoting national health goals.

3. CURRENT PROBLEMS IN THE CONSTRUCTION OF PHYSICAL EDUCATION AND DANCE COURSES IN HIGHER VOCATIONAL COLLEGES FROM THE PERSPECTIVE OF HEALTHY CHINA

3.1 Teachers: Insufficient Professional Competence and Teaching Innovation

The quality and ability of teachers is one of the most important factors in the teaching process. At present, the shortage of sports dance teachers in Colleges and universities is prominent. A considerable part of the existing group of sports dance teachers are transferred from other majors, and even some teachers undertake the teaching tasks of multiple sports at the same time. Due to the lack of systematic and standardized professional learning of sports dance and rush to work only through short-term training, they have obvious shortcomings in professional skills and teaching ability, which is difficult to meet the increasingly professional teaching needs of sports dance courses. In addition, with the continuous development of educational philosophy and technology, the traditional "demonstration imitation" teaching mode has been difficult to meet the needs of students, but many teachers' awareness of teaching innovation is weak, and they fail to make full use of Internet technology and multimedia resources to carry out diversified teaching, such as online class schedule and virtual dance training, which can not stimulate students' interest in learning, resulting in poor teaching effect.

3.2 Students: Significant Differences in Learning Attitudes and Foundational Skills

At this stage, the phenomenon of "polarization" is widespread in college sports dance courses, and the phenomenon is gradually aggravated. Influenced by the traditional concept, some students think that sports dance is a "show off", which is not practical, and they do not pay enough attention to the course, and their enthusiasm to participate in classroom learning is not high. There are also some students who show

withdrawal and resistance in the process of learning because of lack of self-confidence and fear of poor body coordination or weak dance foundation. In addition, there is a significant gap between students' dance foundation. Some students have some dance learning experience before entering school, while some students are completely zero foundation, so it is difficult for teachers to formulate a unified teaching plan. If the teaching content is too difficult, zero foundation students will be afraid of difficulties; If the difficulty is too low and the basic students feel that they are lack of challenge, they are easy to lose their learning motivation, which greatly increases the difficulty of teaching and affects the overall teaching progress and effect.

3.3 Curriculum: Inadequate Curriculum Design and Resource Support

In higher vocational sports dance teaching, curriculum setting issues persist. Firstly, course duration is short (1-2 class hours/week), leaving students unable to master theories and skills fully. Lack of after-class practice guidance hinders learning consolidation. Secondly, content overemphasizes skill training while neglecting theoretical teaching on cultural connotations and artistic appreciation, preventing students from understanding sports dance's cultural heritage and artistic value, thus hindering sustained interest and comprehensive quality cultivation. In teaching resources, some colleges lack professional venues and facilities: narrow dance studios, floors unfit for training, outdated audio equipment. Scarce teaching resources like dance costumes and music materials also fail to meet high-quality teaching needs, restricting course development.

4. SOLUTIONS FOR THE CONSTRUCTION OF PHYSICAL EDUCATION AND DANCE COURSES IN HIGHER VOCATIONAL COLLEGES FROM THE PERSPECTIVE OF HEALTHY CHINA

4.1 Taking Fostering Virtue through Education as the Fundamental Task to Transform Traditional Curriculum Concepts

As a public basic course in higher vocational colleges, sports dance, which requires no complex equipment and has a wide appeal, benefits students' physical and mental health. It's essential to promote its positive value and dispel the misconception that only dance - loving students choose it. Firstly, use the sports dance course as a vehicle to carry forward excellent traditional Chinese culture and cultivate socialist core values. Teachers should incorporate traditional culture into teaching, evoking students' patriotism. For example, Mongolian dance's characteristics can enhance students' national identity, body posture, and aesthetic ability in class. Secondly, shift from the traditional "Grading Test and competition" - oriented training mode. Reduce excessive mechanical practice of technical difficulty and focus on students' emotional experiences and value cultivation in dance. By integrating moral education into curriculum design, teaching, and evaluation, sports dance can serve not only as a means for students to acquire skills and build strength but also fulfill the educational goal of "shaping souls, nourishing hearts, and educating through dance".

4.2 Integrating Various Educational Resources to Accelerate the Modernization of Physical Education and Dance Curricula

In the AI era, digital and intelligent PE courses are emerging. To integrate educational resources and modernize sports dance courses, we should focus on digitization, diversification, and collaboration, breaking resource barriers to build a "technology - enabled" curriculum system. As a highly integrative basic discipline, sports dance curriculum construction should combine resources from sports science, art, and pedagogy. Leveraging modern intelligent devices can break time - space constraints. For instance, an "intelligent sports dance experience center" integrating high - def recording, VR, and rehabilitation equipment can achieve "teaching - practice - performance" integration. The essence of modernizing sports dance courses lies in coordinating "people, technology, and culture" via resource integration. Developers and constructors should embrace new technologies and resources, which will boost teaching efficiency, enhance educational quality, and promote the Healthy China strategy.

4.3 Innovating Teaching Practices and Improving Support Systems to Promote High-Quality Development of Physical Education and Dance Curricula

To promote the construction of higher vocational sports dance courses from the perspective of Healthy China, a multi - dimensional development path should be established, focusing on teaching innovation, evaluation reform, and security mechanism improvement. Institutional support is crucial. Higher vocational colleges should prioritize sports dance courses in talent cultivation, set up quality supervision, and regularly assess course construction. For resource security, more funds should be invested in venue/facility upgrades, equipment renewal, and teacher training. Incentive policies for teachers should be enhanced, with curriculum achievements recognized in professional title evaluations. Moreover, deepening industry - education integration and social synergy is essential. Collaborations with sports dance associations, clubs, and cultural enterprises should be strengthened to introduce industry standards and resources, build practice bases, and offer students platforms for commercial performances and event organization. Through media promotion and achievement showcases, the course's social influence can be expanded, forming a school - led, industry - coordinated, and society - participated educational community. This will underpin the sustainable development of sports dance courses and advance the Healthy China strategy in vocational education.

5. CONCLUSION

The promotion of the healthy China strategy brings new opportunities and challenges to the sports dance course in higher vocational colleges. To solve the problems of teachers, teaching and resources in curriculum construction, we need to start with the concept innovation, resource integration and system improvement. Only by integrating morality cultivation into the curriculum, digitally empowering teaching innovation, and building a multi-party collaborative security system, can we release the educational value of the curriculum, enable students to strengthen their physique and character in dancing, and cultivate talents of a new era with both health literacy and cultural confidence for healthy China.

REFERENCES

[1] Lin, W. Z. (2024). Research on the Application of PBL+TBL Teaching Model in College Sports Dance Teaching [Master's thesis, Jingdezhen Ceramic University].

[2] Zhang, J. B., & Dong, Z. S. (2025). Value, Difficulties, and Pathways for the Development of College Sports Dance Teaching from the Perspective of "Internet+". Ice and Snow Sports Innovation Research, 6(2), 84–87.

[3] Zhou, C. (2025). Exploration of an Interdisciplinary Teaching Model in College Sports Dance Instruction. Modern Vocational Education, (6), 173–176.

[4] Bian, B. B., & Huang, W. (2025). Basic Model and Implementation Path of Blended Teaching for Sports Dance in Higher Vocational Education in the Digital Era: A Case Study of Guangxi Preschool Teachers College. Guangxi Education, (06), 160–163.

[5] Song, H. (2025). Research on the Reform of College Sports Dance Public Elective Courses from the Perspective of Sports Aesthetic Education. Contemporary Sports Technology, 15(13), 72–75.

[6] Li, Y. H. (2022). Research on Factors Influencing Sports Dance Learning Interest Among Students in General Universities in Beijing [Master's thesis, Beijing Sport University].

[7] Wu, B. L., & Ji, L. (2023). the Impact of the Chinese Healthy Physical Education Curriculum Model on College Students' Physical Education Learning Outcomes. Journal of Physical Education, 30(3), 106–112.

[8] Guo, M., & Jin, B. (2022). Reform and Optimization of the College Sports Dance Curriculum System in the Context of Fostering Virtue through Education: Review of Research on the Collaborative Development of Fostering Virtue through Education in College Physical Education. Journal of the Chinese Society of Education, (1), 123.

[9] Wang, X. L., & Liu, J. (2021). Exploration of a "Trinity" Teaching Model for College Sports Dance Courses. Journal of Guangzhou Sport University, 41(5), 125–128.

The Practice Path and Value Reconstruction of Empowering College Counselors with Artificial Intelligence in Five Job Responsibilities

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Abstract: In the context of digital transformation in education, the deep integration of artificial intelligence technology and counselor work has become an important path to enhance the effectiveness of education. This article is based on the practical application of AI in vocational undergraduate counselors and the transformation of their educational roles. Research has shown that AI technology is driving the transformation of counselors from experiential work to data-driven education by improving work efficiency, precision education, and scene innovation. Adhering to the essence of education is the core prerequisite for the application of technology.

Keywords: artificial intelligence; instructor; Top 5 job responsibilities; Educational innovation; Digital transformation

1. THE ERA BACKGROUND AND VALUE LOGIC OF AI EMPOWERING COUNSELOR WORK

1.1 The inevitable requirement of digital transformation in education

The Ministry of Education's "Action Plan for Education Informatization 2.0" clearly proposes to promote the all-round digital transformation of education, emphasizing the development goal of "three full, two high, and one large". Jiang Xu pointed out in his article "A Brief Discussion on Artificial Intelligence Empowering Innovative Development of College Counselor Work" that the traditional "experience+intuition" work mode of college counselors is facing severe challenges in the era of data explosion. Taking a vocational college as an example, a survey has shown that counselors need to process an average of 13 types of paper ledgers and summarize data from 8 systems every day, and 62% of their work time is spent on transactional labor. In vocational undergraduate education, there is an urgent need to integrate multidimensional information such as student practical training operation data, enterprise internship evaluation, and skill certificate progress. AI technology, with the help of algorithms such as natural language processing and machine learning, can transform fragmented data into structured educational indicators.

1.2 Dialectical unity of technological empowerment and the essence of education

The educational application of artificial intelligence presents a dual attribute of instrumental rationality and value rationality. At the tool level, the automation processing capability of AI can greatly release the time cost of counselors. According to pilot data from a certain university, the efficiency of AI document tools in generating reward and assistance comments has increased by 7.3 times compared to manual methods, and the error rate has decreased from 18% to 5.2%; the intelligent psychological assessment system can complete psychological screening for 1200 students within 2 hours, which is equivalent to the daily workload of 10 counselors. However, the "fast food style knowledge" recommended by algorithms may lead to shallow cognition. A survey shows that students who use AI vocabulary tools have a 21% lower long-term memory retention rate than traditional memory methods. This dynamic balance of "technological efficiency ethical boundary sense humanistic warmth"

has been validated in the "AI Counselor" project at Hangzhou University of Electronic Science and Technology. the "emotion recognition patch" algorithm developed by it can improve the accuracy of implicit emotion recognition in student text from 68% to 89%, but the final intervention plan still needs to be manually reviewed by the counselor, forming a dual track mechanism of "machine screening human judgment".

2. SCENARIO BASED APPLICATION PRACTICE OF AI IN THE TOP FIVE JOB RESPONSIBILITIES OF COUNSELORS

2.1 Ideological and theoretical education: from one-way dissemination to precise infiltration

AI reconstructs the ideological and political education ecosystem by constructing a three-dimensional model of "content recommendation public opinion monitoring immersive experience". In vocational undergraduate colleges, counselors use web crawling technology to monitor students' comments on platforms such as Zhihu and Bilibili. the application of VR virtual education base is even more groundbreaking. the "Long March Spirit VR Experience Hall" developed by a vocational college analyzes students' attention distribution through eye tracking technology. When the system detects that 85% of students' gaze deviates from the core image in the "Flying to Luding Bridge" scene, it automatically triggers sound enhancement and plot guidance, increasing the retention rate of educational content memory by 44%.

2.2 Party and League Building: From Manual Management to Digital Governance

AI has achieved a triple breakthrough in party and league work, including process automation, decision dataization, and growth visualization. the intelligent party group management system can automatically complete tasks such as verifying member information, calculating group fees, and reviewing eligibility for recommendation. After being applied by a certain department, the development process for team members has been shortened from 15 days to 3 days. In the event planning stage, AI establishes a recommendation model of "professional fit interest matching participation convenience" by analyzing data from 286 party and league activities in the past 3 years. the participation rate of the "Machine Tool Party Member Pioneer Post" activity designed for the electromechanical profession reached 92%, an increase of 53% compared to the traditional plan. the innovative "Digital Party Group Growth Tree" system of a certain university converts 31 indicators such as theoretical learning time, volunteer service frequency, and skill competition results into a visual tree graph. Students can view the gap between themselves and outstanding party members in real time, shortening the average training period for active members by 4.2 months. the data shows that after the application of the system, the comprehensive score of the development quality of party members in departments has increased by 27%, and the satisfaction of enterprises with party member interns has increased by 19 percentage points.

2.3 Academic Guidance: From Experience Warning to Data Prediction

Traditional academic guidance relies on the experience and judgment of counselors, while the closed-loop of "multidimensional data collection dynamic model analysis precise intervention push" constructed by AI is more scientific. the "academic health" indicator system set up by a vocational college includes 18 dimensions such as classroom interaction frequency, standardization of practical training operations, and timeliness of homework submission. When the system detects that student A's "programming error rate" has increased by 15% for two consecutive weeks and their "online Q&A participation rate" has decreased by 40%, it automatically generates a "programming logic fault" warning and pushes a paired assistance plan. After implementing the model, the failure rate of the school decreased by 33% year-on-year, especially in difficult courses such as numerical control programming, where the pass rate of students increased by 29%. the AI homework grading system not only improves efficiency by 12 times, but its "error tracing" function can also locate knowledge gaps. For example, when 62% of students in a certain class were found to have made errors in the calculation of "tool wear compensation", the system automatically

prompted the counselor to provide special guidance, which increased the accuracy of subsequent tests from 58% to 89%. It is worth noting that a pilot university combined AI analysis with teacher experience to form a "double-blind diagnosis" mechanism. the results showed that the consistency rate of the two judgments reached 87%, and the differences were mainly concentrated in the assessment of students' non cognitive abilities.

2.4 Daily Affairs Management: From Paper Ledger to Intelligent Collaboration

The innovation of AI in transactional work presents a triple effect of "efficiency revolution quality improvement experience optimization". the intelligent morning and afternoon inspection system automatically marks students who have not checked in and synchronously pushes reminders by integrating with campus one card data, reducing attendance statistics time from 2 hours/day to 15 minutes with an accuracy rate of 99.7%. Additionally, the policy clause matching error rate has been reduced to 0. Innovation in safety education is particularly prominent, with the development of a "Mechanical Safety Virtual Simulation System" by a vocational college that uses motion capture technology to assess students' operational standards. When a violation occurs, the system immediately triggers visual impact and tactile feedback (such as shaking the seat), increasing the safety assessment excellence rate from 61% to 94%. During the epidemic prevention and control period, a team of counselors developed a "one-stop service platform" that integrated 12 types of transaction processes, achieving online completion of 92% of daily affairs and a student satisfaction score of 4.8/5.

2.5 Psychological Health Education: From Manual Screening to Human Computer Collaboration

AI has built a full chain service of "universal testing screening key intervention continuous companionship" in psychological education. the "Psychological Cloud Platform" deployed by a certain university established a depression tendency prediction model by analyzing 11 dimensions of data including student friend circle copy, classroom expression recognition, and movement trajectory. Its screening accuracy reached 83%, which is 17% higher than traditional scales. the application of the "AI Psychological Companion Robot" breaks the time limit, and its emotional computing engine can recognize 23 emotional patterns, providing empathetic responses for students who confide late at night, with a continuous usage rate of 68% for 30 days. But data shows that 62% of students still actively seek a counselor for an interview after communicating with robots, confirming the necessity of human-machine collaboration. A special education vocational college has also developed a "sign language emotion recognition system" for hearing-impaired students, which uses cameras to capture gesture changes and analyze emotional states, reducing the time for detecting psychological problems in this group by 50%.

3. IMPLEMENTATION PATH AND CAPABILITY BUILDING OF AI ASSISTED EDUCATION

3.1 Third order improvement model for counselor AI application ability

3.1.1 Tool replacement phase (1-2 months)

At this stage, the focus is on cultivating basic technical operational skills. Counselors need to master the data perspective and visualization functions of smart forms, template creation of AI document tools, and basic settings of psychological assessment systems. the training data of a certain team shows that after 40 hours of training, 92% of counselors can independently complete tasks such as automated statistics of morning and afternoon examination data and batch generation of comments, saving an average of 2.1 hours per day. the "AI Tool Treasure Box" mini program developed by a vocational college integrates 12 commonly used functions and is equipped with short video tutorials, which improves the tool mastery speed of new counselors by 50%. It is worth noting that at this stage, we need to be vigilant about "technology dependence". A survey conducted by a certain university found that 17% of counselors overly rely on AI to generate comments, resulting in content homogenization. Later, this was improved by establishing an "AI draft manual polishing" mechanism.

3.1.2 Mode innovation stage (3-6 months)

Focus on scenario based applications and process reengineering capabilities. Counselors

need to learn how to translate business needs into AI solutions, such as adding characteristic indicators such as "skill certificate progress" and "enterprise internship evaluation" to the learning warning system based on the characteristics of vocational education. the key to this stage is the cultivation of data thinking. Counselors need to be able to identify the underlying problem of "practice theory disconnect" from the data contradiction of "normal attendance during practical training but declining theoretical grades". A certain training program has improved the data correlation analysis ability of counselors by 43% within 3 months through a "data case workshop" format.

3.1.3 Ecological construction phase (6-12 months)

Emphasis is placed on systems thinking and collaborative governance capabilities. Counselors need to promote the construction of departmental level data platforms and connect data interfaces for academic affairs, student work, employment, and other systems. At the same time, it is necessary to cultivate "AI ethics awareness". A certain university established a "counselor AI ethics group" and formulated a "data collection whitelist", which clearly prohibits the collection of sensitive information such as students' religious beliefs and medical records. This system was later promoted as an example by the education regulatory department. Ecological construction also includes cultivating an "AI assistant" team. A vocational college selected 30 "AI mentors" from students to assist senior teachers in solving technical problems, increasing the usage rate of AI tools in the entire college from 58% to 89%.

REFERENCES

[1] Jiang Xu. A Brief Discussion on Artificial Intelligence Empowering Innovative Development of College Counselor Work [J]. Guizhou Education Daily, December 18, 2024

[2] Anonymous. Promoting the Empowerment of College Counselors with Artificial Intelligence [J]. China Education News Network, May 28, 2025

[3] Qi Yeda, Xu Xiaoqiang. Analysis of the High Quality Development of College Counselor Work Empowered by Artificial Intelligence [J]. WeChat Public Platform, March 10, 2024

[4] Chongqing Electronic Science and Technology Vocational University College Counselors in the AI Era: the Role Transition from Transaction Managers to Life Leaders [J]. WeChat Public Platform, May 16, 2025

[5] Hangzhou University of Electronic Science and Technology. Relying on artificial intelligence technology, Hangzhou University of Electronic Science and Technology launches AI counselors [J]. Hangzhou University of Electronic Science and Technology, December 20, 2024

[6] Anonymous AI+counselors shape new momentum for ideological and political education in universities [J]. Sohu, October 30, 2024

[7] Anonymous. Generative artificial intelligence empowers the work of university counselors: application scenarios, practical concerns, and optimization approaches [J]. Changjiang Wenku, 2025(1)

[8] Anonymous. Exploration of the Work Mode of College Counselors under the Background of Artificial Intelligence [J]. China Education Research, December 6, 2024

[9] Ministry of Education. Education Informatization 2.0 Action Plan [Z]. 2018

Exploring the path of Field Engineer under the background of Science-Education Integration

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Abstract: In September 2022, the Ministry of Education, the Ministry of Industry and Information Technology, and four other departments jointly launched a special training program for Field Engineer in vocational education, aiming to meet the demand for high-level professional talent in high-end industries. the Science-Education Integration with vocational education is a key direction proposed by the 20th National Congress for the advancement of vocational education. This article explores the positioning of on-site engineer training and the training approach under the context of the Science-Education Integration, providing insights for the development of future on-site engineer training mechanisms.

Key words: Science-Education Integration, Field Engineer, training path

1. INTRODUCTION

In September 2022, the Ministry of Education, the Ministry of Industry and Information Technology, and four other departments jointly issued a notice titled "Notice on the Implementation of the Special Training Program for Field Engineer in Vocational Education. " the notice emphasizes the need to align with the high-end, digital, intelligent, and green development requirements of key sectors such as advanced manufacturing, strategic emerging industries, and modern services, and to coordinate the supply of education with the demand for talent. This initiative aims to implement a special training program for Field Engineer in vocational education. the report from the 20th National Congress of the Communist Party of China proposed to promote coordinated innovation among vocational education, higher education, and continuing education, and to advance the integration of vocational and general education, industry-education collaboration, and science and education integration, optimizing the positioning of vocational education. Science-Education Integration into vocational education can significantly drive innovation in various aspects of vocational education, providing new directions for its high-quality development. Researching the training mechanisms of on-site engineering in vocational education under the background of science and education integration is crucial for the high-quality training of Field Engineer.

2. THE TRAINING ORIENTATION OF "FIVE ABILITIES & FOUR SPIRITS" FOR FIELD ENGINEER

The Notice on the Implementation of the Special Training Program for Field Engineer in Vocational Education, jointly issued by the Office of the Ministry of Education and four other departments, describes Field Engineer as individuals who embody the spirit of craftsmanship, excel in operations, understand processes, manage effectively, collaborate well, and innovate. the Notice outlines the requirements for on-site engineering, aligning with the skill needs of the corresponding level of talent in the regional industry, clarifying the capability requirements and core values for training Field Engineer. According to the Chinese Dictionary, an engineer is defined as a specialized personnel capable of independently completing the design and construction of a specific technical task. Field Engineer, viewing the production site as a production system, are familiar with the production process and operational skills at the front line, capable of managing and coordinating personnel and projects, and able to propose comprehensive solutions to problems that arise on the production site.

The realization of these tasks can be summarized by the 'five characteristics' of Field Engineer: profound theoretical knowledge, a composite professional skill set, comprehensive problem-solving skills, innovative thinking and awareness, and autonomous thinking and action. the core values are encapsulated in the 'four qualities': a deep sense of patriotism, the spirit of a master craftsman, the habit of integrating knowledge with practice, and the habit of continuous learning.

3. EXPLORATION OF THE TRAINING PATH OF "FIELD ENGINEER" UNDER THE BACKGROUND OF SCIENCE-EDUCATION INTEGRATION

The Science-Education Integration with vocational education can address the bottleneck in cultivating high-level vocational education students, reform the current training methods, deepen the industry-education integration model, and inject new vitality into the development of vocational education. This integration differs from the Science-Education Integration in general undergraduate education, focusing more on application-oriented integration. It integrates scientific spirit, technology, and research into activities related to the training of vocational education students. These activities include teaching methods for teachers, learning methods for students, evaluation methods for learning outcomes, theoretical content, practical teaching content, extracurricular activities, skills competitions, horizontal research projects, and vertical research projects.

4. FRONTIER TECHNOLOGY HELPS THE DIGITAL COLLECTION OF PROCESS EVALUATION ELEMENTS, AND BIG DATA PROCESSING IMPROVES THE CONVENIENCE OF STUDENT EVALUATION.

Education emphasizes the comprehensive development of students 'abilities. Traditional outcome-based evaluations cannot fully assess the improvement in students' abilities during the learning process. Process-oriented evaluations can address this shortcoming by capturing improvements in students 'innovative thinking, teamwork, and language expression. However, the randomness, instantaneous nature, and individual differences in the phenomena observed during process-oriented evaluations, along with the large volume of recorded data and the complexity of data processing, pose significant challenges. However, by integrating cutting-edge technology, dynamic classroom data can be captured using technological means to record students' process-oriented performance. Additionally, big data processing methods can be used to analyze each student's personalized performance data, and value-added analysis of students' phased performance can be conducted, achieving a four-dimensional comprehensive evaluation that includes process-oriented, value-added, outcome-based, and comprehensive evaluations.

5. DIGITAL SUPPORT FOR "CLASSROOM & TRAINING BASE & ENTERPRISE SCENE" MULTI-DIMENSIONAL LEARNING FIELD TO HELP IMPROVE VOCATIONAL ADAPTABILITY.

In the purely academic learning environment, regardless of the educational model adopted, students 'subconscious role remains that of' student. 'This role, combined with environmental influences, fails to foster professional qualities. Moreover, the practical problems students face and need to solve in this setting are often pre-set and disconnected from real-world production scenarios, failing to develop students' ability to address actual production issues. A diversified learning environment that integrates classrooms, training bases, and enterprise settings can break down the physical barriers of traditional learning, allowing students to truly 'step out' and engage in genuine work-study integration. This dual identity of being both a student and an enterprise employee helps students adapt to their new professional roles subconsciously, which is beneficial for cultivating their professional qualities. Additionally, in real enterprise production environments, students can apply the skills they have learned and accumulated in classrooms and training bases, enhancing their ability to identify and solve practical problems in real-world work settings, thereby improving their professional adaptability. the digital teaching sharing platform connects various teaching scenarios, enabling the sharing of students 'learning and evaluation data, achieving unified assessment

on one platform. This provides crucial references for teachers' learning situation analysis, enterprises 'job recruitment, and students' comprehensive self-awareness.

6. "ONLINE TEACHING PLATFORM & BIG DATA PUSH TECHNOLOGY" CHANGES THE LEARNING MODE AND LAYS A SOLID FOUNDATION FOR STUDENTS' INTERDISCIPLINARY THEORETICAL KNOWLEDGE.

Addressing issues in production site systems not only requires familiarity with the production process but also the ability to innovate independently. This is the core driving force behind the continuous learning and innovation capabilities of Field Engineer. A solid foundation in multidisciplinary theoretical knowledge is essential for technological or methodological innovations in production sites, which is a significant shortcoming for vocational education students in achieving high-level skill development. Relying solely on modular applied theoretical knowledge from classroom learning is insufficient; scientific discoveries provide a platform for interdisciplinary theoretical studies. the development of online teaching platforms enables students to access relevant theoretical knowledge based on their professional needs. Big data recommendation technology can tailor content to students 'preferences, facilitating comprehensive learning. While big data is just one tool, it should be integrated into the blended teaching and evaluation system, guided by classroom instruction, to ensure systematic learning of theoretical knowledge and modular learning of application-oriented knowledge, thereby fostering students' innovative awareness and capabilities.

7. ADHERE TO THE CONCEPT OF GREEN DEVELOPMENT, SCIENTIFIC RESEARCH THINKING PROMOTES THE ITERATION AND UPDATE OF PRACTICAL TRAINING EQUIPMENT, AND ENRICHES THE PRACTICE TEACHING MODE.

The current practical teaching content uses pre-assembled training equipment. Students use fixed training equipment to complete predetermined tasks, which limits their creativity and innovation. Meanwhile, with the rapid advancement of production technology and science in enterprises, the pace of equipment updates is accelerating. Many training devices are used for a shorter period before their utilization rate drops or they are left idle. By embracing the concept of green development and fostering innovative thinking, students can form teams to customize and update idle equipment. Systematically improving projects can enhance students' teamwork, systematic thinking, and independent innovation skills, while deepening their understanding of green development.

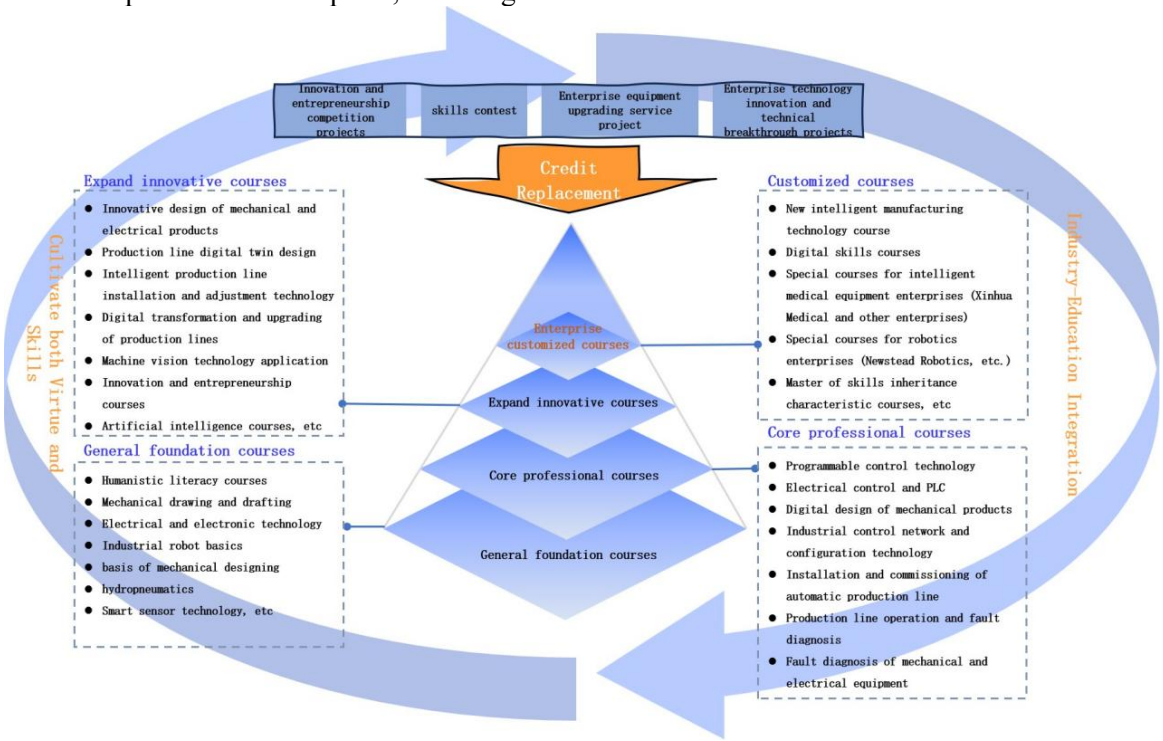
8. THE CREDIT REPLACEMENT MECHANISM IS CONSTRUCTED TO PROMOTE PERSONALIZED EDUCATION IN PROJECT PRACTICE

To establish a credit exchange mechanism, implement a three-track training system that combines regular education with project workshops and technical challenges. Encourage students to participate in enterprise equipment upgrades, process optimization, and other technical applications, innovations, and development projects through school-enterprise collaboration. Implement personalized teaching to enhance the cultivation of highly skilled talents with engineering practice innovation capabilities and the ability to solve complex on-site problems. Refine course module credits, establish a course capability matching matrix, and set up credit conversion standards to bridge the gap between project capabilities and course module capabilities. Establish a credit evaluation committee to ensure the effective implementation of credit recognition and exchange systems.

9. SCHOOLS AND ENTERPRISES ARE CONNECTED TO BUILD A CURRICULUM SYSTEM OF "BASIC & CORE & EXPANSION AND INNOVATION & CHARACTERISTIC CUSTOMIZATION"

Optimize the existing curriculum system to construct a 'foundation+core+expansion and innovation+distinctive orientation' framework (as shown in Figure 21). Introduce advanced industry technology courses, such as digital skills and new intelligent equipment technologies, into the expansion and innovation modules. This ensures that the curriculum closely aligns with current

industrial trends, laying a solid foundation for cultivating high-quality professionals who meet the actual needs of the industry. Collaborate with companies like Xinhua Medical, Qilu Petrochemical, and Citizen Precision Machinery to develop customized industry-education integration courses that precisely match the job competency standards and production processes of these enterprises. This approach facilitates a smooth transition from campus to the workplace, ensuring a seamless alignment between talent development and industry demands. Regularly invite enterprises to participate in course evaluations, and adjust the course hours dynamically based on changes in industry technical standards and job competency profiles. This flexibility optimizes the professional course configuration, ensuring that the course content evolves in tandem with industry advancements.



10. BREAK THE BARRIERS OF PROFESSIONAL BOUNDARIES, CREATE THE“ 1+N” TRAINING MODE OF MAIN AND AUXILIARY MAJORS, AND CULTIVATE CROSS-PROFESSIONAL COMPOUND TALENTS

Field Engineer tackle systematic issues at production sites, requiring individuals with a combination of 'refined operational skills, process knowledge, management expertise, collaborative abilities, and innovative thinking. ' They must possess high standards in both individual and comprehensive skills, including on-site techniques, production processes, project management, and personnel collaboration. the current specialized training methods are insufficient to meet these goals. To address this, an On-site Engineer College should be established to manage student affairs, develop specialized training programs for Field Engineer, integrate resources from both in-school and out-of-school instructors and practical training facilities, coordinate the alternating work-study schedules, and adopt a '1 main N auxiliary' model for on-site engineer training, thereby achieving a comprehensive development of interdisciplinary and composite skills.

REFERENCES

[1] Notice of the Office of the Ministry of Education and other five departments on the implementation of the Special Training Program for Field Engineer in Vocational Education. 2022-10-09. http://www. moe. gov. cn/srcsite/A07/s7055/202211/t20221104_932353. html

[2] Yan Yan. Theoretical connotation and path selection of on-site engineer training under the

perspective of science, education and integration [J]. China Vocational and Technical Education, 2023(18):56-62.

Research on the Role Reconstruction of Counselors in the Safety Governance System of Universities in the New Era

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Abstract: This study, against the backdrop of the multidimensional challenges faced by safety governance in universities in the new era, systematically analyzes the current functions and institutional dilemmas of counselors in safety work. It proposes an innovative approach to reconstructing the role of counselors through the establishment of a "Safety Education Specialist" system. the research finds that the current safety functions of counselors suffer from three major issues: ambiguous positioning, insufficient training, and weakened implicit influence. By selecting Safety Education Specialists from among counselors and implementing cross-appointments, departmental collaboration barriers can be overcome, achieving an integrated safety governance model of "management - education - service. " the study recommends building an implementation framework from three aspects: institutional guarantees, professional training, and dynamic evaluation, providing actionable solutions for implementing the "Spirit of the National University Safety Work Conference. "

Keywords: University Safety Governance; Counselor; Safety Education Specialist; Institutional Design; Cross-Departmental Collaboration

1. INTRODUCTION

1.1 Policy Background and Research Motivation

1.1.1Legal Requirements

With the development of higher education in the new era, the importance of safety governance in universities has become increasingly prominent. *The Higher Education Law of the People's Republic of China*, as the fundamental law regulating higher education activities, explicitly stipulates in Article 53 The legal responsibility of universities to "maintain campus safety and stability. "Article 57 requires"strengthening ideological and political education and daily management of students, "which provides a legal basis for the role of counselors in safety governance. Additionally, Article 21 of the *Regulations on Fire Safety Management in Higher Education Institutions* emphasizes"establishing a fire safety education system, "Article 49 of the *Regulations on the Management of Students in Regular Higher Education Institutions* requires counselors to"conduct safety education, "and Article 13 of the Cybersecurity Law proposes"enhancing students' network literacy education. "These specialized regulations further refine the specific requirements for university safety governance and imply the safety education responsibilities that counselors should undertake.

The *Spirit of the National University Safety Work Conference* points out: "It is necessary to build a safety governance system with 'full participation and comprehensive coverage, '" highlighting the urgency of reshaping the role of counselors in the university safety governance system.

1.1.2 Practical Dilemmas

Under the traditional model, counselors often only serve as "messengers" of safety policies in safety work, such as organizing class meetings to read safety documents, but the actual improvement in students' safety awareness and behavior is limited. A survey at a certain university showed that the pass rate for students' safety knowledge tests was only 68%, reflecting the inadequacy of traditional safety education methods. At the same time,

the technical governance of security departments lacks humanistic care, leading to communication and cooperation barriers between students and security departments. Due to their natural affinity and influence among students, counselors have untapped potential advantages in safety governance, and the collaborative barriers between departments are evident.

1.2 Research Innovations

1.2.1This study has the following innovations: Theoretical breakthrough: For the first time, it closely integrates the "Safety Education Specialist" system with the functional reconstruction of counselors, proposing a specific "cross-appointment" operational plan, breaking the traditional model of counselors and security departments working in isolation. Policy coupling:It systematically reviews the relevance of laws and regulations such as the *Higher Education Law* and the *Fire Safety Regulations* to the role of counselors, deeply analyzes the shortcomings of existing policies in defining the safety functions of counselors, and fills gaps in related research.

II. Legal Analysis and Real-World Challenges of the Role of Counselors in the University Safety Governance System

1.3 Legal Basis for the Safety Functions of Counselors

1.3.1. Responsibilities Under the Framework of the *Higher Education Law*

Article 42 of the Higher Education Law of the *People's Republic of China* stipulates that counselors are responsible for "daily ideological and political education and management of students, " which includes guiding safety values. For example, in daily ideological and political education, counselors can convey safety awareness and values to students through themed class meetings or individual conversations, guiding them to establish correct safety concepts. Article 53 requires universities to "maintain campus safety and stability, " and counselors indirectly fulfill safety responsibilities by "maintaining campus order, " such as resolving conflicts between students, preventing violent incidents, and maintaining harmony and stability on campus.

1.3.2. Specific Directions of Specialized Regulations

Article 49 of the *Regulations on the Management of Students* explicitly requires counselors to conduct safety education. However, in practice, safety education in many schools is often limited to simple presentations during class meetings, lacking systematic and targeted approaches. Article 21 of the *Regulations on Fire Safety Management in Higher Education Institutions* requires universities to establish a fire safety education system but does not specify the specific execution standards and responsibilities of counselors, leading to inadequate implementation of fire safety education. Article 13 of the *Cybersecurity Law* requires "enhancing students' network literacy education, " but due to the lack of detailed implementation rules and resource support, counselors often face difficulties in conducting cybersecurity education, making it hard to achieve the desired results.

1.3.3. Mental Health Education Requirements

The *Guidelines for Mental Health Education* require counselors to "identify signs of psychological crises. " However, in practice, there is a lack of effective information-sharing mechanisms between counselors and security departments. For example, a tragic incident at a university involved a student committing suicide due to depression. Before the incident, the student had shown signs of a psychological crisis, but due to the absence of a smooth communication channel between the counselor and the security department, timely intervention measures were not taken, ultimately leading to the tragedy.

1.4 Institutional Causes of Real-World Dilemmas

1.4.1. Ambiguous Functional Boundaries

Regulations do not clearly define the authority and responsibilities of counselors and security departments in key scenarios. For example, in dormitory safety hazard inspections, the *Fire Safety Regulations* require "full participation" but do not designate specific responsible parties, leading to unclear responsibilities and mutual buck-passing between counselors and security departments. In the prevention of online fraud, the *Cybersecurity Law* requires "strengthening education, " but there is no clear operational guide for how counselors should conduct prevention education, making effective implementation difficult in practice.

1.4.2. Uninstitutionalized Implicit Influence

Counselors have natural affinity and influence among students, enabling them to establish good communication and trust relationships when handling student affairs. This emotional bond holds significant value in safety governance. However, due to the lack of corresponding institutional guarantees, this implicit influence of counselors has not been fully utilized. For example, in resolving dormitory conflicts, counselors can mediate patiently and meticulously to resolve disputes between students, but the trust built during this process is not further leveraged or expanded in subsequent safety education. Additionally, due to the lack of feedback channels and cross-departmental collaboration incentives, the role of counselors in safety governance is difficult to effectively demonstrate. For instance, data on students' violations are not systematically fed back to relevant departments, and the assessment indicators for security departments and counselors are separate, resulting in a lack of effective collaboration between the two.

III. Institutional Innovation: Role Design and Legal Adaptation of the "Safety Education Specialist"

1.5 Legal Basis for Role Positioning

1.5.1Aligning with the "All-Staff Education" Principle of the *Higher Education Law*

Article 52 of the *Higher Education Law* positions counselors as "guides for student growth. " the Safety Education Specialist, as an extension of the counselor's role, further strengthens the guiding and educational role of counselors in the student growth process. It requires counselors to not only focus on students' academic and ideological development but also pay attention to safety issues, integrating safety education into daily student education and management.

1.5.2Addressing the Collaboration Bottleneck in the *Opinions on Further Strengthening Safety Work in Higher Education Institutions*

The Opinions on Further Strengthening Safety Work in Higher Education Institutions require "establishing a functional department linkage mechanism" but do not specify the operational methods. the Safety Education Specialist achieves institutional collaboration through a "dual identity" (counselor+safety specialist). On the one hand, as a counselor, the Safety Education Specialist can accurately grasp the safety situation of students, understand their ideological dynamics and behavioral characteristics, providing precise information support for safety education and management. On the other hand, by working and learning side by side with the security department, the Safety Education Specialist focuses on student safety education and management, promoting information sharing and collaboration between the security department and counselors, breaking departmental barriers, and forming a joint force for safety governance.

1.6 Duty Modules and Legal Connections

The Safety Education Specialist has clear responsibilities and tasks in safety knowledge popularization, psychological crisis intervention, fire safety education, and cybersecurity guidance, all of which are closely aligned with relevant regulations. In safety knowledge popularization, the Safety Education Specialist can develop "case-based teaching packages" based on the requirements of Article 49 of the *Regulations on the Management of Students*, using real cases to help students understand safety knowledge more intuitively and improve safety awareness. In psychological crisis intervention, according to the Guidelines for Mental Health Education, the Safety Education Specialist can collaborate with the security department to establish "high-risk student profiles, " identifying and intervening in students with psychological crises in a timely manner to safeguard their mental health. In fire safety education, following the requirements of Article 21 of the *Fire Safety Regulations*, the Safety Education Specialist can organize "immersive drills, " using real cases to enhance students' fire safety skills. In cybersecurity guidance, based on Article 13 of the *Cybersecurity Law*, the Safety Education Specialist can conduct "anti-fraud themed class meetings+data alerts, " combining real cases and data analysis to improve students' cybersecurity awareness and prevention capabilities.

2. IMPLEMENTATION PATH: INSTITUTIONAL GUARANTEES AND DYNAMIC OPTIMIZATION

2.1 Policy Support System

2.1.1. Revision of University Regulations

The establishment of Safety Education Specialists should be incorporated into the

Student Safety Management Measures, with clear selection criteria and assessment indicators. In terms of selection criteria, Safety Education Specialists should hold relevant professional certificates such as psychological consultant or fire safety training certificates, ensuring solid professional knowledge and skills. For assessment indicators, the pass rate of student safety knowledge tests, the incidence of violations, and response times to emergencies should be used as key evaluation criteria to motivate Safety Education Specialists to actively fulfill their duties. Additionally, a cross-departmental collaboration mechanism should be established, forming a "Safety Governance Joint Committee" with members from the security office, student affairs office, legal advisors, etc. This committee would address issues of overlapping authority and responsibilities not clarified by regulations, develop safety governance plans, coordinate departmental efforts, and form a joint force for safety governance.

2.1.1Cross-Departmental Collaboration Mechanism

The "Safety Governance Joint Committee" should hold regular meetings to enhance communication and collaboration between departments. During these meetings, departments can report progress, share experiences, and jointly address challenges in safety governance. For example, the security department can report on campus safety conditions and hazard inspections, the student affairs office can provide feedback on students' ideological dynamics and safety needs, and legal advisors can offer professional legal opinions, collectively formulating strategies and measures for safety governance.

2.2 Professional Capacity Building

2.2.1. Training System Design

Safety Education Specialists should receive 20 hours of specialized training annually, covering key points of regulations such as the *Fire Safety Regulations* and the *Data Security Law*, as well as methods and techniques for safety education. Training methods can include expert lectures, case analyses, and field visits, enabling Safety Education Specialists to stay updated on the latest regulations and work requirements, thereby improving their safety education capabilities. "Scenario-based simulation assessments" should be introduced, simulating real situations like handling online fraud or fire emergencies to evaluate the practical skills and emergency response abilities of Safety Education Specialists, ensuring they possess solid professional knowledge and skills.

2.2.2. Incentive Mechanism Innovation

Safety performance should be linked to professional title evaluations. Safety Education Specialists who excel in safety work should receive additional points or priority consideration during title evaluations. A "Safety Work Innovation Award" should be established to encourage Safety Education Specialists to develop new media safety education content, such as short videos or apps, enhancing the engagement and effectiveness of safety education. These incentives can motivate Safety Education Specialists to work more proactively and creatively, promoting continuous improvement in safety education.

2.3 Effect Evaluation and Iteration

2.3.1. Quantitative Indicators

A scientific and reasonable evaluation system should be established, including metrics such as the pass rate of student safety knowledge tests, the incidence of violations, and response times to emergencies. These indicators should be regularly analyzed to assess the effectiveness of safety education and identify areas for improvement. For example, regular safety knowledge tests can evaluate students' mastery of safety knowledge, while statistics on violations can assess the impact of safety education on student behavior. Recording emergency response times can evaluate the efficiency of safety governance.

2.3.2Qualitative Feedback

Feedback from students and the security department should be collected through methods like student forums and analysis of security department work logs. This feedback can provide insights into student satisfaction with the content, methods, and outcomes of safety education, as well as the security department's opinions and suggestions on collaboration. Based on qualitative feedback, safety education efforts can be adjusted and optimized to enhance their relevance and effectiveness.

3. CONCLUSIONS AND PROSPECTS

3.1 Research Conclusions

Existing regulations provide space for the role reconstruction of counselors, but internal institutional refinements are needed to clarify their specific responsibilities and operational requirements in safety governance, ensuring effective implementation of regulations.

The "Safety Education Specialist" system can achieve a dynamic balance between regulatory requirements and practical needs, effectively overcoming departmental collaboration barriers. By selecting Safety Education Specialists from among counselors and implementing cross-appointments, the influence of counselors among students and the technical advantages of security departments can be fully leveraged, achieving an integrated "management - education - service" safety governance model and improving campus safety.

3.2 Policy Recommendations

The Ministry of Education should issue the *Guidelines for the Establishment of Safety Education Specialists in Universities*, further detailing the selection, training, and assessment criteria for Safety Education Specialists, providing clear policy guidance and operational standards for universities. Additionally, guidance and supervision of university safety education efforts should be strengthened to promote continuous improvement of the safety governance system. Universities should incorporate safety governance effectiveness into the evaluation indicators for "Double First-Class" initiatives, aligning with the high-quality development requirements of the *Higher Education Law*. By integrating safety governance with overall university development, universities can place greater emphasis on safety education, increase safety investments, and enhance safety governance standards.

3.3 Future Directions

Future research can further explore the "three-dimensional collaboration" model involving Safety Education Specialists, legal counselors, and psychological committee members, leveraging the professional strengths of different roles to form a more comprehensive safety governance system. Additionally, theoretical research on safety education can be deepened to continuously refine the theories and methods of safety education, providing a stronger theoretical foundation for university safety governance.

REFERENCES

[1] Standing Committee of the National People's Congress. *Higher Education Law of the People's Republic of China* [Z]. 2018 Amendment.

[2] Ministry of Education, Ministry of Public Security. *Regulations on Fire Safety Management in Higher Education Institutions* [Z]. 2010.

[3] Ministry of Education. *Regulations on the Management of Students in Regular Higher Education Institutions* [Z]. 2017 Revision.

Strategies of Legal Education and Legal Awareness Cultivation for Students in Higher Vocational Colleges

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Abstract: Currently, in the context of talent cultivation at higher vocational colleges, the focus is primarily on developing students' professional knowledge and technical skills. While legal education is included, it is mainly delivered through courses on ideological and moral education and legal awareness, as well as legal education lectures. Both the content and methods of teaching are lacking. To enhance the effectiveness of legal education and foster a strong legal consciousness among students, schools and teachers need to implement a comprehensive training system and strategic approaches to improve the practical outcomes of legal education. This will help instill a deep understanding of the rule of law in students, strengthen their legal awareness, and nurture them into law-abiding individuals who are willing to take on social responsibilities, laying a solid foundation for their future lives and careers.

Key words: Higher Vocational Colleges; Students 'Legal Education; Students' Legal Awareness; Cultivation

1. INTRODUCTION

Vocational colleges are the cradles of high-tech and skilled talent development. Vocational college students are the future of the country and the hope of the nation, shouldering the great responsibility of national rejuvenation. It is particularly important to emphasize legal education for students, enhancing their legal awareness to minimize potential negative impacts on industries and society in the future. Currently, there are numerous shortcomings in both the content and methods of legal education in vocational colleges, hindering the improvement of its quality and the enhancement of students 'legal awareness. Therefore, vocational colleges should continuously optimize the content of legal education by integrating theory with practice and combining small classes with large classes. This will help strengthen students' legal awareness, ensuring they know what is right and wrong, and adhere to the legal bottom line and red line, becoming new-era individuals capable of shouldering the great responsibility of national rejuvenation.

2. THE IMPORTANCE OF LEGAL EDUCATION AND THE CULTIVATION OF STUDENTS' LEGAL AWARENESS IN VOCATIONAL COLLEGES

2.1 Cultivate students' spirit of rule of law

In our country's education system, institutions at different levels serve distinct roles. Vocational colleges and junior colleges primarily focus on providing targeted and specialized educational services, aiming to supply society with highly skilled professionals. Students in these institutions often have weaker foundational learning abilities and a generally weak sense of legal awareness. Therefore, promoting the rule of law and fostering a spirit of the rule of law is a key teaching responsibility for vocational colleges and junior colleges. Although there are few rule of law courses in these institutions, the main goal is to use existing courses to cultivate students' legal awareness, such as patriotism, law-abiding behavior, integrity, and honesty. This helps enhance students 'ideological awareness and contributes significantly to building a socialist rule-of-law country. However, currently, there are few students in vocational colleges and junior colleges who can consciously and effectively apply legal knowledge, making it difficult for them to use legal means to protect themselves or uphold justice, which is detrimental to cultivating a strong rule of law spirit.

Therefore, vocational colleges and junior colleges need to comprehensively implement rule of law education, integrating it with ideological and political education, and prioritize cultivating students' legal awareness at the ideological level, thereby fostering a strong rule of law spirit.

2.2 Improve the content of legal education

Integrating legal education into the national education system is an educational initiative launched by our country to respond to the call for governing the country according to law. the aim is to enhance the legal awareness of the younger generation, reduce crime rates, and foster a harmonious society. This initiative also applies to higher vocational colleges and technical institutes. the state has developed specific methods for implementing legal education in these institutions, tailoring approaches to different majors 'talent development plans. By integrating legal knowledge into various fields, this approach subtly influences and transforms students' mindsets. However, higher vocational colleges and technical institutes face challenges such as a lack of legal education courses and a limited knowledge base, which hinders the effective implementation of legal education. Integrating ideological and political education into legal education can effectively address these issues. Ideological and political education can enrich the content of legal education, making legal knowledge more concrete and relevant through ideological and political perspectives.

3. ANALYSIS ON THE CURRENT SITUATION OF LEGAL EDUCATION AND LEGAL AWARENESS CULTIVATION FOR VOCATIONAL COLLEGE STUDENTS

3.1 Insufficient supply of legal education

At this stage, the primary channel for legal education in higher vocational colleges is the Ideological and Moral Education and Legal Education course. However, the content of legal education in this course is relatively limited, necessitating the introduction of specialized legal courses and public elective courses to enhance the systematic nature of legal education. However, the shortage of qualified legal educators in relevant majors has hindered the expansion of legal education courses and class hours, leading to a significant shortage of legal education resources in higher vocational colleges. Furthermore, due to the insufficient legal literacy of relevant personnel, there is a lack of ability to effectively tap into and integrate legal educational resources both within and outside the school, resulting in legal education activities lacking effective resource support and having a rather dry content.

3.2 Lack of coordination in legal education

Vocational colleges need to adopt a holistic approach in legal education, requiring close collaboration among teaching, management, and service departments to jointly foster students' legal awareness. However, the current state of legal education in vocational colleges is fragmented, with the responsibility for legal education being limited to a few teachers and counselors. On one hand, the lack of internal drive for legal education in vocational colleges means that it does not receive adequate attention; on the other hand, the independent operations of teaching, management, and service departments, along with the disparity in legal literacy among all faculty members, pose significant challenges to the coordinated development of legal education.

4. ANALYSIS OF STRATEGIES FOR LEGAL EDUCATION AND LEGAL AWARENESS CULTIVATION OF VOCATIONAL COLLEGE STUDENTS

4.1 Build campus culture brand and carry forward core socialist values

Creating a campus cultural brand and promoting core socialist values is crucial for guiding vocational college students to establish correct worldviews, outlooks on life, and values. Firstly, by aligning with the school's actual conditions, it is essential to define the positioning and theme of the campus cultural brand, carefully select representative core values, and develop a unique campus culture. Secondly, the school should fully utilize various publicity platforms, such as radio, television, and bulletin boards, to actively promote and publicize the campus cultural brand, making it resonate deeply with the students. Additionally, organizing a variety of campus cultural activities, such as themed lectures, essay contests, and debate competitions, allows students to experience and practice core values in real-life scenarios.

Strengthening interactions and exchanges with excellent external cultural resources can help promote the campus cultural brand to society, increasing awareness and recognition of the school's core values.

4.2 Promote the construction of "digital campus" and improve the level of information

To promote the construction of a 'digital campus' and enhance the level of information, it is essential to strengthen the development of information infrastructure, including campus networks, computer labs, and multimedia classrooms, to provide a conducive information environment for teachers and students. It is also crucial to build and improve the school's information management system to achieve informatization in teaching, research, and management. Through the digital campus platform, data sharing, information exchange, and resource management can be optimized, thereby improving the school's management efficiency and service quality. Additionally, actively promoting information education to enhance students 'information literacy is important. This can be achieved by offering information technology courses and organizing information skills competitions, which help cultivate students' information awareness and capabilities, laying a solid foundation for their future development.

4.3 Establishing institutions for the rule of law

To enhance the overall effectiveness and quality of legal education, higher vocational colleges must strengthen effective external collaboration, including cooperation with government, judicial bodies, social organizations, and other external resources. Additionally, deepening internal collaboration is essential, which involves establishing efficient communication and collaboration mechanisms among different departments within the school to ensure that all aspects of legal education work together effectively. To address these challenges, higher vocational colleges should optimize their top-level design by setting up specialized legal institutions, enhancing the coordination of legal education, strengthening external collaboration, and deepening internal collaboration, thereby improving the overall effectiveness and quality of legal education.

4.4 Teacher professional development and training

The learning levels of students in secondary and higher vocational schools vary widely, and they generally have poor self-discipline, leading to a strong reliance on teachers. This indirectly highlights the importance of regularly organizing professional training activities for teachers to ensure educational quality. To achieve the expected outcomes of these training activities, it is essential to establish a continuous teacher training system that covers legal education teachers in both secondary and higher vocational schools. This can be achieved by organizing regular seminars, workshops, and online courses, which help teachers update their professional knowledge and stay informed about the latest legal developments and teaching methods. Additionally, it is crucial to focus on enhancing teachers' practical skills by encouraging them to participate in real legal work, such as part-time lawyer or legal advisor roles, or by allowing them to personally experience legal practice operations. This enables teachers to better apply theoretical knowledge in practice, thereby improving the relevance and effectiveness of their teaching through a deeper integration of theory and practice.

5. CONCLUSION

Ideological, moral, and legal education is a crucial component of the ideological and political education for vocational college students in the new era. It plays a vital role in fostering core socialist values, legal awareness, and moral character among these students. We should recognize the importance of this education, actively explore innovative methods, and create a more favorable environment for ideological and political education for vocational college students in the new era.

REFERENCE

[1] Wang Chen, Lu Xinyu. Research on the Cultivation of College Students' Legal Awareness [J]. Theoretical Studies, 2016(2):130-131.

[2] Sun Fan. Research on the Path of Cultivating College Students' Legal

Awareness in the New Era [J]. Law and Society, 2020(20):158-159.
[3] Zeng Jiehao. Research on Cultivating Legal Risk Awareness of Self-media Entrepreneurship among Vocational College Students [J]. Guangdong Vocational Education and Research, 2023(2):79-82, 90.

Research on the Construction of Training Mode for Excellent Maritime Talents in the Context of New Quality Productive

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Abstract: In the context of new quality productive, the shipping industry is undergoing transformation and upgrading, and the core competency requirements for excellent maritime talents are also changing significantly. Currently, there is a serious misalignment between the structure, scale, and quality of maritime talent cultivation in China and the implementation needs of the national strategies for building a strong maritime nation, a strong seafarer nation, and a strong maritime power. This situation fails to keep pace with the rapid development of maritime science and technology. As pioneers in maritime education, the reconstruction of the cultivation model for excellent maritime talent can provide valuable experience for the comprehensive reform of vocational education. Therefore, this paper aims to explore the construction of a model for excellent maritime talent in the context of new quality productive forces, with the goal of providing theoretical support and practical guidance for the innovation and development of maritime education.

Key words: New quality productivity, excellent maritime talents, training mode

1. INTRODUCTION

In September 2023, new quality productivity was put forward. the development of new quality productivity such as technological innovation has promoted the deep transformation and upgrading of industries and driven the global economy to develop in a positive direction. As the core carrier of the global economic cycle, the shipping industry undertakes the transportation of more than 80% of global commodity trade. However, with the continuous progress of science and technology, the requirements for labor productivity have also changed. For the shipping industry, which is upgrading, the core quality requirements for maritime talents are also changing. the existing training structure, scale and quality of excellent maritime talents in China can no longer fully meet the needs of the implementation of the national strategies of a maritime power, a powerful seaman country, a marine power and the rapid development of navigation science and technology. the Outline of the Education - powerful Country Construction Plan (2024-2035) clearly states, accelerate the construction of a modern vocational education system and cultivate great artisans, skilled workers and high - skilled talents. the training of excellent maritime talents, as the forerunner of navigation education, can provide reference for the comprehensive reform of vocational education. Therefore, this paper will take the research on the core literacy requirements of excellent maritime talents under the background of new quality productivity as a breakthrough point, reconstruct the current training mode of excellent maritime talents, and then promote the reform of navigation education and teaching, serve the transformation and upgrading of the shipping industry, and enhance the international competitiveness of China's excellent maritime talents [1-3].

2. THE NECESSITY OF RECONSTRUCTING THE TRAINING MODE OF EXCELLENT MARITIME TALENTS

New quality productivity is based on technological revolutionary breakthroughs, innovative allocation of production factors and deep industrial transformation and

upgrading. It emphasizes innovation, and integrates new technologies, new fields, new models, new business forms, new requirements and new functions, marking a new stage and new characteristics of productivity development. In the context of rapid scientific and technological development and deep industrial transformation, new quality productivity has become a key driving force for economic and social development. In recent years, through technological innovation, management innovation and institutional innovation, productivity has achieved a qualitative leap. Strategic emerging industries such as new energy, new materials, advanced manufacturing and electronic information have risen rapidly, especially new technology waves such as the Internet of Things, big data and artificial intelligence are booming. Frontier technologies represented by intelligent navigation algorithms, blockchain logistics tracking and digital twin operation and maintenance are deeply integrated into the global shipping system architecture. This technological penetration not only drives the iterative upgrade of ship equipment to an autonomous decision-making system, but also reshapes the operation mode, management paradigm and industrial chain structure of modern shipping, promoting the comprehensive transformation of the shipping industry from the traditional mode to intelligent ships and green shipping. At present, the global intelligent shipping market is expanding at a compound annual growth rate of 21.3%. the shipbuilding volume of new energy ships such as LNG and other low carbon emission fuels, electric and hybrid power in China has exceeded 35%. Intelligent ships and green shipping have become the development frontier of the global shipping industry [4-5].

As an important pillar industry of the national economy, the shipping industry, driven by new quality productivity represented by technological innovation, is vigorously promoting the accelerated transformation of the ship industry towards greening and autonomous navigation. However, the development of new quality productivity has not only given birth to new industrial forms and employment models, but also put forward new requirements for the industrial talent structure, urgently needing to build a highly adaptable talent system. Labor productivity is constantly developing with the progress of science and technology. the development of new quality productivity requires the creation of an industrial talent structure that matches it. the pace of its transformation and upgrading is accelerating, and the core quality requirements for maritime talents have also changed profoundly. However, when looking at the current situation of excellent maritime talents training in China, in terms of training quality, scale and structure, there is a certain inadaptability compared with the in - depth implementation of the national strategies of a maritime power, a seaman - powerful country, a marine power and the rapid development of navigation science and technology. This mismatch not only restricts the high - quality development of the shipping industry, but also to a certain extent affects the international competitiveness of China's excellent maritime talents. In this context, the reconstruction of the training mode of excellent maritime talents is particularly crucial and urgent. As the forerunner and vanguard in the field of navigation education, the innovative exploration and practice of the training mode of excellent maritime talents can provide valuable experience and useful reference for the comprehensive reform of the entire vocational education system. By reconstructing the training mode, it promotes the deep - seated reform of navigation education and teaching concepts, curriculum systems, teaching methods and so on, to better serve the transformation and upgrading needs of the shipping industry, improve the overall quality and international competitiveness of China's excellent maritime talents, and help China move from a large shipping country to a powerful shipping country [6-8].

3. THE CONSTRUCTION OF THE TRAINING MODE OF EXCELLENT MARITIME TALENTS

Navigation education must comply with the requirements of the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW), and must also comply with the relevant provisions of the Training Outline for Seafarers on Chinese Seagoing Ships (2022 Edition)

promulgated by the national competent authority. It has more distinct vocational characteristics compared with other majors. Therefore, the formulation of the training mode for excellent maritime talents is more particular [7-12].

3.1 Adjust the training orientation of excellent maritime talents

The training orientation of excellent maritime talents should be closely combined with the needs of the national marine power strategy and the transformation and upgrading of the shipping industry. Extend the knowledge system to the cross disciplinary fields of navigation, and cultivate compound and high quality excellent maritime talents who can actively serve the national strategic requirements and the needs of industry and enterprises, and who have solid navigation knowledge, innovation ability, practical ability and international vision.

3.2 Revise the training plan for excellent maritime talents

In order to meet the current talent needs of the shipping industry, schools and enterprises jointly revise the training plan for excellent maritime talents. According to the students' levels and combined with the post requirements, implement differentiated training for general education and elite talents, and build a hierarchical and classified talent training model: ① Meet the qualification standards: meet the basic requirements of the STCW Convention to ensure that students reach the seafarers' qualification standards; ② Ability improvement: For compound and high quality excellent maritime talents, add corresponding courses as needed, provide targeted teaching, build a hierarchical and classified training model for excellent maritime talents, and realize the transformation of excellent maritime talents from single-skilled to internationalized compound-skilled (Digital+Skilled) excellent maritime talents. Adopt the training method of alternating between school and ship (1 (school)+0.5 (ship)+1 (school)+0.5 (ship)) to implement the Training Plan for Excellent maritime talents. Adopt a teaching model of school-enterprise cooperation with dual-tutor responsibility, giving full play to the role of the modern apprenticeship system. Jointly develop an on-board training curriculum system and its implementation plan to facilitate students' mastery of the latest applied technologies in the shipping industry.

3.3 Reconstruct the knowledge training system for excellent maritime talents and develop digital curriculum resources

On the premise of meeting the basic requirements of the STCW Convention for navigation knowledge as the basic knowledge system and reaching the seafarers' qualification standards, add digital courses such as dual fuel simulators, intelligent ship operation and maintenance, and maritime big data analysis. Develop digital courses such as "green technology+digital tools+international rules" trinity new energy ship training and course modules such as intelligent marine engine fault diagnosis virtual simulation to increase students' digital knowledge reserve and application ability. While serving the transformation and upgrading of the shipping industry and the marine power strategy, realize new teaching resources and teaching modes for related navigation majors.

3.4 Build a mixed team of teachers composed of captains/chief engineers+ professors+ professional skilled talents

Schools and enterprises jointly create a mixed teaching team and research team with inter communication between schools and enterprises, combination of full time and part time, and mutual promotion of teaching and research. Give full play to the operation skills and navigation experience advantages of captains/chief engineers, the innovation ability and educational experience advantages of professors, and the digital equipment development and application advantages of professional skilled talents. jointly develop teaching resources such as project based teaching materials and digital resources, research new industry technologies, and develop new industry equipment, so as to realize the two - way improvement of the teaching ability and engineering practice ability of full - time and part - time teachers.

3.5 Innovate the teaching mode and improve the practical teaching system

Through the integration of industry resources, the reconstruction of curriculum modules and the deep integration of intelligent technologies such as virtual simulation/big data with the teaching scene, break through the limitations

of traditional courses and build a closed - loop teaching system that supports the digital transformation of shipping. And create a digital training environment through the four ships (campus ship experimental training rooms, large - scale maneuvering simulators, dock - moored training ships and ocean - going training ships), put forward a research plan for the construction of the training mode of excellent seafarers based on digital shipping. Through applying the reconstruction plan to the talent training of the schools where the members of the research group are located, adjust and optimize it in the practice process, and then improve the new Digital+Skill internship and training plan for related navigation majors.

4. CONCLUSION

The development of new quality productivity requires the creation of an industrial talent structure that matches it. With the transformation and upgrading of the shipping industry, the requirements for excellent maritime talents have changed from single-skilled to internationalized compound-skilled (Digital+Skilled) excellent maritime talents. As the core driving force for the transformation and upgrading of the shipping industry, the reconstruction of the training mode of excellent maritime talents can provide valuable experience for the comprehensive reform of vocational education. Therefore, based on the needs of national strategies and the transformation and upgrading of the shipping industry, it is imperative to reconstruct the training mode of excellent maritime talents.

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REFERENCES

[1] People's Daily. Xi Jinping Presided over a Symposium on Promoting the Comprehensive Revitalization of Northeast China in the New Era, Emphasizing the Importance of Northeast China's Mission and the Effort to Write a New Chapter for its Comprehensive Revitalization [N]. 2023, 1-5.

[2] Xinhua News Agency. Xi Jinping Emphasized During the 11th Collective Study Session of the Political Bureau of the CPC Central Committee: Accelerate the Development of New Quality Productivity and Solidly Promote High-Quality Development [N]. 2024.

[3] Jun Cui, Desheng Du. New quality productive forces, urban-rural integration and industrial chain resilience [J]. International Review of Economics & Finance. 2025, 102, 104245.

[4] Qingyi Meng, Qianbin Di, Yiming Liu, Xiaolong Chen. How New Quality Productivity Becomes a New Driving Force for Marine Economy High-Quality Development: An Empirical Analysis Based on New Technology, New Forms, and New Economy [J]. Water 2025, 17(7), 987.

[5] Ding Zihua. A Research on the Construction of International Training Course for Maritime Talents Based on the Initiative of "One Belt and One Road" [J]. Journal of Shipping and Ocean Engineering. 2018, 8:69-75.

[6] Po Yang, Linli Jiang, Sipei Xu. Vocational Education and Employment of Skilled Talents in the Context of Construction of Skilled Society [J]. Journal of East China Normal University (Educational Sciences). 2024, 42(4):23-38.

[7] Xinyi Ma, Congjin Miao, Li Wang, et al. Training Model of Talent Development under the Integration and Development of Maritime Industry: Experience and Enlightenment from China-ASEAN Free Trade Port [J]
. International Journal of New Developments in Education. 2024, 6(4):234-240.

[8] Xing Hui. Collaborative Training of Maritime Talents between Schools and Enterprises Oriented to Industry Demand [J]. Maritime Education Research, 2021, 39(03):6-14.

[9] Xue Han, Lan Sihai. Applied University Industry Talent Training for Intelligent Navigation New Majors [J]. Pearl River Shipping, 2021(10):88-89.

[10] Qi Jundi, Jia Liankun. Research on the Path of Integration and Development of Maritime Culture and Blue Sports Industry

under the Background of "Belt and Road" [J]. Dongyue Tribune, 2016, 37(08):188-192.
[11] Liao Weizhang, Hou Jingfeng, Li Tianhua. Exploration of Professional Talent Training for Intelligent Construction Technology [J]. Building Technology, 2022, 53(11):1580-1584.
[12] Yu Yang, Meng Xiongfei. Research on Modern Industrial Colleges of Applied Undergraduate Universities in Maritime Majors [J]. Journal of Qingdao Ocean Shipping College, 2023, 44(03).

Research and Practice on Digital-Based Training Model for Excellent Seafarers in Shipping Industry

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Abstract: The advent of the digital era has brought new opportunities and challenges to the training of excellent seafarers in the shipping industry. This paper focuses on the digital-based training model for excellent seafarers in shipping, and conducts in-depth research on the practical applications of virtual simulation training, the construction of online education platforms, and the development of digital curriculum systems. By analyzing the role of this model in improving seafarers' comprehensive quality and adapting to the digital transformation of the shipping industry, it proposes optimization strategies, providing theoretical and practical references for cultivating excellent seafarers who meet the needs of the times.

Keywords: Digitalization; Shipping; Excellent Seafarers; Training Model; Virtual Simulation

1. INTRODUCTION

With the continuous development of global trade, the shipping industry, as an important link in international trade, has become increasingly prominent. However, the rapid development of the shipping industry has put forward higher requirements for the quality of seafarers. At the same time, the rapid development of digital technologies is profoundly changing the operation mode and management methods of the shipping industry, and the digital transformation of the shipping industry has become an inevitable trend. In this context, the traditional seafarer training model can hardly meet the industry's demand for excellent seafarers. How to innovate the seafarer training model with the help of digital means to cultivate excellent seafarers with solid professional knowledge, proficient operational skills and good comprehensive quality has become an urgent problem in the field of maritime education.

The application of digital technology in the field of education has achieved remarkable results, providing new ideas and methods for talent training in various industries. Introducing digital technology into the training of shipping seafarers can break the limitations of time and space, enrich teaching resources, innovate teaching methods, and improve training quality. Therefore, studying the digital-based training model for excellent seafarers in shipping is of great practical significance.

2. CONSTITUENT ELEMENTS OF THE DIGITAL-BASED TRAINING MODEL FOR EXCELLENT SEAFARERS IN SHIPPING

2.1 Technical Support

The digital-based training model for excellent seafarers in shipping cannot do without the support of advanced technologies. Virtual simulation technology can simulate various complex navigation scenarios, allowing seafarers to train in a safe environment and improve their ability to deal with emergencies. For example, through virtual simulation systems, scenarios such as severe weather, ship collisions, and equipment failures can be simulated. Seafarers conducting emergency handling training in a virtual environment can accumulate rich practical experience and enhance their ability to deal with actual problems.

Big data analysis technology can track and analyze seafarers' learning situations, providing a basis for personalized teaching. By collecting seafarers' learning data in online learning platforms and virtual simulation

training, such as learning duration, test scores, and operational errors, and processing them with big data analysis algorithms, it can accurately grasp each seafarer's learning characteristics and weak links, and then formulate personalized learning plans and training programs for them, improving learning efficiency and training effects.

In addition, the Internet of Things (IoT) technology can realize real-time connection between ship equipment and onshore teaching systems. Seafarers can remotely monitor the operation status of ship equipment through the IoT, understand the working principles of the equipment and troubleshooting methods, and enhance their familiarity with ship equipment.

2.2 Curriculum System

The curriculum system is the core content of seafarer training. the digital-based training model for excellent seafarers in shipping needs to build a corresponding digital curriculum system. This curriculum system should combine the actual needs of the shipping industry and integrate digital knowledge and skills.

In terms of basic courses, in addition to traditional courses such as navigation, ship structure and equipment, and marine meteorology and oceanography, digital-related courses such as computer networks, database technology, and artificial intelligence should be added to enable seafarers to master necessary digital basic knowledge.

In terms of professional courses, it is necessary to combine the digital transformation of the shipping industry and offer courses such as intelligent ship operation and management, remote ship monitoring and diagnosis, and electronic chart application. At the same time, digital technology should be deeply integrated with professional courses. For example, in the navigation course, electronic chart systems are used for route design and navigation simulation; in the ship power plant course, virtual simulation systems are used to display the working principles and operation procedures of ship power plants. In addition, practical course modules should be set up, including virtual simulation training courses and online practical courses, so that seafarers can master digital skills in practice.

2.3 Teaching Methods

The digital-based training model for excellent seafarers in shipping needs to adopt diversified teaching methods to improve teaching effects. the combination of online and offline teaching methods is one of the more effective ways. Online teaching can use online education platforms to carry out activities such as video lectures, online discussions, and online tests, allowing seafarers to learn anytime and anywhere. Offline teaching can provide face-to-face counseling and practical operation training to solve problems encountered by seafarers in learning.

Interactive teaching methods are also essential. Through online interactive platforms and virtual simulation systems, real-time interaction between teachers and students, and between students themselves can be realized. For example, in virtual simulation training, students can form teams to complete navigation tasks together, and teachers can provide real-time guidance and comments, cultivating students' teamwork ability and problem-solving ability.

Case teaching method also plays an important role in digital seafarer training. By collecting and sorting out actual cases in the shipping industry, such as ship accident cases and intelligent ship application cases, and displaying and analyzing them with digital means, seafarers can understand the problems that may be encountered in actual work and their solutions, and improve their ability to analyze and solve problems.

3. PRACTICAL APPLICATION CASES

3.1 Construction of Virtual Navigation Laboratory in Domestic Colleges

A well-known domestic maritime college has established an advanced virtual navigation laboratory, which uses virtual reality technology and 3D modeling technology to build a highly realistic navigation environment. Students can enter the virtual navigation scene by wearing virtual reality equipment to conduct training in ship driving, route design, and emergency handling.

In the virtual navigation laboratory, students can simulate various complex navigation situations, such as heavy weather, navigation in narrow waterways, and ship collision avoidance. the laboratory system can feedback real-time information such as the ship's

movement status and changes in the surrounding environment, allowing students to obtain a real driving experience. Through repeated training in the virtual environment, students' driving skills and emergency handling capabilities have been significantly improved.

At the same time, the laboratory is also combined with an online education platform. Students can upload their training data in the virtual laboratory to the platform, and teachers can analyze and evaluate students' training situations through the platform, providing personalized guidance for students.

3.2 Development of Enterprise Online Training Platform

A large shipping enterprise has developed an online training platform to improve the comprehensive quality and professional ability of seafarers. the platform integrates rich teaching resources, including video courses, e-books, case analyses, and test question banks. Seafarers can independently choose learning content according to their own needs and time.

The platform also has online communication and Q&A functions. Seafarers can communicate and discuss with other seafarers and teachers during the learning process to solve problems encountered in learning in a timely manner. In addition, the platform is equipped with learning progress tracking and assessment modules. Seafarers can check their learning progress at any time to understand their learning situation, and enterprises can also assess seafarers' learning outcomes through the platform.

Through the application of the online training platform, the training coverage of seafarers in this enterprise has been greatly improved, the training cost has been reduced, and the professional ability and comprehensive quality of seafarers have been significantly enhanced.

4. EXISTING PROBLEMS AND OPTIMIZATION STRATEGIES

4.1 Existing Problems

Insufficient digital teaching resources: At present, although some maritime colleges and enterprises have begun to build digital teaching resources, generally speaking, the quantity and quality of digital teaching resources are still insufficient. Some teaching resources have outdated content, which is difficult to meet the needs of the digital transformation of the shipping industry; some teaching resources lack pertinence and practicality, unable to meet the actual learning needs of seafarers.

Teachers lack digital teaching capabilities: Many teachers, although having solid professional knowledge, are relatively weak in digital teaching capabilities. They are not proficient in the use of digital teaching tools and platforms, and it is difficult to effectively integrate digital technology into the teaching process, affecting the effect of digital teaching.

Seafarers' acceptance of digital learning is not high: Due to factors such as age and education, some seafarers have a low understanding and acceptance of digital learning. They are accustomed to traditional teaching methods and have resistance to digital learning methods such as online learning and virtual simulation training, which affects the promotion and application of the digital training model.

4.2 Optimization Strategies

Increase investment in digital teaching resources: Maritime colleges and enterprises should increase investment in the construction of digital teaching resources, encourage teachers and professional and technical personnel to develop digital teaching resources that meet the needs of the shipping industry. At the same time, strengthen cooperation with other colleges and enterprises to realize the sharing of digital teaching resources and improve the utilization efficiency of resources.

Strengthen digital training for teachers: Regularly organize teachers to participate in digital teaching training to improve their ability to use digital teaching tools and platforms, and cultivate their digital teaching concepts and methods. Encourage teachers to carry out digital teaching research and practice, constantly innovate teaching models, and improve teaching quality.

Improve seafarers' awareness and interest in digital learning: Through publicity and guidance, let seafarers understand the advantages and importance of digital learning and change their learning concepts. In the process of digital learning, pay attention to cultivating seafarers' autonomous learning

ability and collaborative learning ability, and adopt diversified teaching methods and incentive mechanisms to improve seafarers' learning interest and enthusiasm.

5. CONCLUSION

The digital-based training model for excellent seafarers in shipping is an inevitable choice to adapt to the digital transformation of the shipping industry. Through advanced technical support, a sound curriculum system and innovative teaching methods, it can effectively improve seafarers' comprehensive quality and professional ability, and cultivate more excellent seafarers who meet the needs of the times for the shipping industry.

Although there are still some problems in the practical application of this model, these problems can be gradually solved through optimization strategies such as increasing investment in digital teaching resources, strengthening digital training for teachers, and improving seafarers' awareness and interest in digital learning, so as to continuously improve the digital training model.

In the future, with the continuous development and application of digital technology, the digital-based training model for excellent seafarers in shipping will become more mature and perfect, providing a strong talent guarantee for the healthy development of the shipping industry.

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REFERENCES

[1] Li Ming. Research on the Application of Digital Technology in Maritime Education [J]. Chinese Maritime Education, 2023(02):1-5.

[2] Wang Qiang. Influence of Intelligent Ship Development on Seafarer Training and Countermeasures [J]. Navigation Technology, 2022(06):78-81.

[3] Zhang Wei. Application of Virtual Simulation Technology in Practical Teaching of Navigation Majors [J]. Research and Exploration in Laboratory, 2022(04):156-159.

[4] Zhao Na. Current Situation and Development Trend of Online Education Platforms in Seafarer Training [J]. Continuing Education Research, 2021(11):67-70.

[5] International Maritime Organization. International Convention on Standards of Training, Certification and Watchkeeping for Seafarers [M]. Beijing: China Communications Press, 2020.

The Multidimensional Impact of Social Practice in Integrating Red Culture, Education, and Child Development

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Abstract: In the summer of 2025, the "Red Rhyme and Childhood Dreams" Leading Team from the School of Foreign Languages, Taishan University, participated in a series of "Colorful Holiday" social practice activities in Laixi, Qingdao, with a focus on inheriting red culture, promoting quality education, and fostering all-round development of children. This initiative, rooted in the historical context of the birthplace of the "Good Eighth Company on Nanjing Road, " integrated ideological guidance, academic tutoring, scientific exploration, artistic creation, and physical education, creating a unique educational model that combines red gene inheritance with practical learning. Through in-depth participation of English education major volunteers, the program not only enriched rural children's summer life but also achieved mutual growth: children enhanced their patriotic awareness, academic abilities, and creative skills, while volunteers deepened their understanding of educational practice and social responsibility. This paper systematically explores the implementation paths, educational effects, and theoretical implications of the program, aiming to provide insights for optimizing rural children's education and improving pre-service teacher training.

Keywords: Social Practice; Red Culture Inheritance; Child Development; English Education; Volunteer Service; Rural Education

The "Colorful Holiday" social practice program organized by the "Red Rhyme and Childhood Dreams" Leading Team represents a proactive exploration of how colleges and universities can serve rural education and cultural inheritance. Set against the backdrop of national efforts to strengthen ideological and political education and promote rural revitalization, this initiative takes Laixi, Qingdao—home to the birthplace of the "Good Eighth Company on Nanjing Road"—as its practice base, leveraging local red resources to design a series of targeted educational activities. the team, composed mainly of English education majors, integrates their professional advantages with the mission of red culture inheritance, creating a distinctive model that combines language teaching, cultural dissemination, and child development. Over the course of nearly two weeks, volunteers carried out activities in different villages such as Xiaoyuan Village, covering more than 200 children, and achieved remarkable results in both educational practice and social influence.

At the core of the program is the innovative integration of red culture into various educational activities, making abstract revolutionary spirits tangible and perceptible to children. One of the most notable practices is the use of VR technology to recreate historical scenes of the "Good Eighth Company. " In the "Magic Optics - Decoding VR Technology" class, volunteers first introduced the history of the Eighth Company, from their perseverance during wartime to their dedication in peacetime, and then guided children to produce simple VR glasses. When the children wore the self-made devices and "witnessed" the soldiers helping villagers carry water, guarding public property, and other historical scenes, the red stories, which were once only heard in textbooks, suddenly became vivid and immersive. This approach not only stimulates children's interest in history but also helps them understand the connotation of the Eighth Company's spirit of

"hard work, unity, and dedication" at a deeper level. As one child excitedly shared after the activity, "I felt like I was standing next to the soldiers. They were so great!"

In addition to technological assistance, the “Transmission” of red culture is also embedded in language teaching, which reflects the professional characteristics of English education majors. Volunteers cleverly integrated red elements into English classes by selecting words such as "hero, " "brave, " and "unite" and associating them with the deeds of the Eighth Company. For example, when teaching the word "perseverance, " volunteers told the story of the Eighth Company soldiers persisting in training in harsh environments, enabling children to not only master the vocabulary but also understand the spiritual connotation behind it. In the "Hero Stories in English" session, children were encouraged to retell simplified stories of the Eighth Company in English, such as "The Soldiers Helped Grandma, " which not only improved their language skills but also deepened their emotional identification with red culture. This integration of language teaching and ideological education embodies the educational concept of "cultivating morality through education, " making English learning a carrier for spreading positive values.

The program also attaches great importance to the all-round development of children, covering academic tutoring, scientific exploration, artistic cultivation, and physical exercise. In terms of academic tutoring, volunteers adopted diversified teaching methods according to the characteristics of children of different ages. For younger children, they used "red story associative memory method" to help them recite ancient poems, combining the story of "the Eighth Company soldiers saving food" with the artistic conception of the poems to make the boring memory vivid and interesting. For older children, they focused on explaining the difficulties in summer homework, integrating the deeds of the Eighth Company into composition guidance and math problem-solving, such as using the scenario of "soldiers distributing materials" to explain application problems, so as to improve children’s learning efficiency while permeating red education.

Scientific exploration activities are another highlight of the program, aiming to cultivate children’s innovative thinking and practical ability. In the "Straw Block Construction" activity, volunteers provided children with ordinary straws and challenged them to build models of bridges, castles, or other structures in groups. During the process, children not only needed to give full play to their imagination but also learn to communicate and cooperate with team members to solve problems such as unstable structures. A group of children tried repeatedly to build a "bridge" and finally succeeded after adjusting the angle and connection method of the straws. Their cheers of joy echoed in the yard, which was the best proof of the cultivation of scientific literacy. Similarly, the production of simple optical toys, such as kaleidoscopes and magnifying glass focusing experiments, let children feel the charm of science in practice, and volunteers took the opportunity to tell the story of scientists’ perseverance in exploration, encouraging them to develop the spirit of seeking truth and innovation.

Artistic creation is also an important part of the program, which helps to cultivate children’s aesthetic ability and cultural identity. In the "Red Architecture on Fingertips" art class, volunteers introduced the architectural characteristics of the former site of the Eighth Company while explaining the mortise and tenon structure, and guided children to create works with red themes using clay. Some children shaped red flags fluttering in the wind, some reproduced the scene of soldiers standing guard, and others made stone houses where the Eighth Company once lived. Each work was full of childlike innocence and sincere feelings. In the "Millennium Silhouette Workshop" intangible cultural heritage paper-cutting activity, volunteers taught children various paper-cutting techniques such as folded paper-cutting and silhouette, and encouraged them to create works with themes of national unity, red flags, and doves of peace. When the children held up their works, which were simple but full of meaning, they not only mastered a traditional craft but also understood the cultural connotation behind it. This combination of traditional art and red themes helps to plant the

seeds of cultural confidence in children's hearts.

Physical education and team-building activities also play an important role in the program, promoting children's physical and mental health while inheriting the spirit of the Eighth Company. Volunteers organized traditional games such as shuttlecock kicking, sandbag throwing, and rope skipping, as well as new sports like frisbee. In the "relay shuttlecock kicking" game, children needed to cooperate with their teammates, pass the shuttlecock skillfully, and cheer for each other. the scene was full of laughter and shouts. Through these activities, children not only exercised their bodies but also experienced the importance of teamwork and perseverance, which is exactly the inheritance of the Eighth Company's spirit of "uniting as one and overcoming difficulties. " As volunteers observed, after several team games, the children became more willing to help each other and less likely to give up when encountering difficulties.

The "Colorful Holiday" program is not only a process of educating children but also a journey of growth for volunteers majoring in English education. For pre-service teachers, this practice provides a rare opportunity to apply theoretical knowledge to real teaching scenarios. In the process of preparing lessons, they need to consider the characteristics of rural children, adjust teaching methods, and integrate professional knowledge with red culture, which greatly improves their curriculum design and classroom management abilities. A volunteer reflected, "In the past, we learned teaching methods in textbooks, but in practice, we found that children's attention span is short, so we have to use more games and interactions. This experience has taught me that flexibility is more important than rigid plans. " In addition, facing the diverse needs of children—some are shy and unwilling to speak, some have weak academic foundations, some are overly active—volunteers have learned to observe carefully, communicate patiently, and provide targeted guidance, which lays a solid foundation for their future career as teachers.

Moreover, the interaction with rural children has deepened volunteers' understanding of educational equity and social responsibility. They found that although rural children have limited access to educational resources, they are full of curiosity and desire for knowledge. A volunteer wrote in her diary, "When a child asked me eagerly, 'Sister, can you teach us English every week?', I realized that our short-term help is far from enough. As future educators, we should pay more attention to rural education and contribute our strength to narrowing the educational gap. " This sense of responsibility, stimulated by practice, is an important part of pre-service teacher training, making them not only focus on professional growth but also pay attention to the social value of education.

However, the program also faces some challenges that need to be addressed in future practices. First, the short duration of the activity makes it difficult to achieve long-term educational effects. Most activities last only 2-3 days in a single village, and although they can arouse children's interest in a short time, it is difficult to consolidate the educational achievements. Second, there is a lack of individualized teaching due to the large age difference of participating children (ranging from 6 to 12 years old). the same teaching content may be too simple for older children and too difficult for younger ones, affecting the teaching effect. Third, the integration of English teaching and red culture needs to be further optimized. Sometimes, in order to highlight the red theme, the language teaching objectives are ignored, resulting in a lack of systematicness in knowledge transmission.

To solve these problems, the following suggestions are put forward: first, establish a long-term mechanism for university-village cooperation, arrange volunteers to carry out regular activities in key villages, and cooperate with local primary schools to integrate the content of the "Colorful Holiday" into after-school services, so as to ensure the continuity of education. Second, adopt a stratified teaching model, design different activity plans according to the age and cognitive level of children, and provide personalized guidance. For example, for younger children, focus on games and hands-on activities; for older children, increase the proportion of academic tutoring and in-depth discussion of red culture. Third, develop special teaching materials that integrate

English learning and red culture, such as bilingual picture books about the stories of the Eighth Company, to improve the scientificity and effectiveness of curriculum integration.

In conclusion, the "Colorful Holiday" social practice program in Laixi has achieved remarkable results in inheriting red culture, promoting children's all-round development, and training pre-service teachers. It proves that through innovative educational design and enthusiastic volunteer participation, rural children's education can break through the limitations of resources and achieve rich and colorful development. At the same time, it also shows that social practice is an important way to improve the quality of pre-service teacher training, which can help them integrate theoretical knowledge with practical experience and establish a sense of educational responsibility. In the future, with the continuous improvement of the program and the active participation of more colleges and universities, such social practice activities are expected to play a more important role in promoting rural education development and red culture inheritance, contributing to the cultivation of new generations with ideals, abilities, and responsibilities.

REFERENCES

[1] Education Research Group of the Ministry of Education. Thoroughly Studying Xi Jinping's Important Expositions on Education [M]. Beijing: People's Publishing House, 2021.

[2] LERNER R M, LERNER JV, BENSON J B (Eds.). Positive youth development: Research and applications for promoting thriving, in adolescence. Volume4l of Advances in Child Development and Behavior [M]. Waltham, MA: ElsevierAcademic Press, 2011.)

[3] Wang Jiayi, Feng Qingyun. Research on the Long Term Mechanism of Social PracticeEducation in Colleges and Universities [J]. Education Research, 2018, (12):87-95.

[4] LI D, EDWARDS V. the impact of overseas training on project-based learning in Chinese TEFL classrooms [J]. Language Teaching Research, 2013, 17(3):329-348. DOI: 10.1177/1362168813481446.

Research on Data Fusion Technology for Autonomous Driving in New Energy Vehicles

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Abstract: To address issues of perception accuracy caused by heterogeneous multi-source data, temporal-spatial asynchrony, and dynamic environmental interference in autonomous driving for new energy vehicles, this study focuses on the application of data fusion technologies in this field. A multimodal data acquisition architecture is first constructed, integrating onboard sensors (LiDAR, cameras, millimeter-wave radar), V2X communication data, and new energy vehicle-specific data from battery management systems (BMS) and power systems. A distributed fusion framework based on improved federated learning is proposed, leveraging attention mechanisms and spatiotemporal convolutional networks (STCN) to handle spatiotemporal data correlations, while Kalman filtering is introduced to optimize temporal synchronization of dynamic data. Through simulation platforms and real-vehicle experiments, the robustness and real-time performance of the data fusion algorithm are validated across different scenarios, including urban roads, highways, and complex weather conditions. Results demonstrate a 12.3% improvement in target detection accuracy and a 37.6% reduction in data transmission latency compared to traditional fusion methods. The proposed approach effectively supports the coordinated control needs of energy management and autonomous driving in new energy vehicles, providing technical support for safe redundancy design in high-level autonomous driving systems.

Keywords: Autonomous Driving; New Energy Vehicles; Data Fusion; Multi-Source Heterogeneous Data; Federated Learning

1. Introduction

1.1 Research Background and Significance

The integration of autonomous driving technology with new energy vehicles (NEVs) represents a pivotal direction in the evolution of intelligent transportation systems. NEVs, characterized by their electrified powertrains and sophisticated energy management systems, generate a vast array of operational data that differs fundamentally from that of traditional internal combustion engine vehicles. This data, when combined with inputs from autonomous driving sensors and vehicle-to-everything (V2X) communication networks, creates a complex ecosystem of information flows. The accurate and timely processing of such multi-source data is critical for ensuring the safety, efficiency, and reliability of autonomous NEVs.

Current challenges in this domain stem from the heterogeneous nature of data sources, which include lidar point clouds, camera images, radar signals, battery management system (BMS) metrics, and real-time traffic information. These data streams exhibit varying sampling rates, spatial reference frames, and noise profiles, leading to inconsistencies that hinder effective decision-making. Additionally, the dynamic nature of driving environments—such as sudden weather changes or complex urban traffic scenarios—exacerbates the difficulty of maintaining robust data synchronization and fusion.

Addressing these challenges holds significant practical value. From a safety perspective, enhanced data fusion can reduce the risk of sensor misinterpretation, a leading cause of autonomous vehicle incidents. From an energy efficiency standpoint, integrating powertrain data with environmental 感知

enables more optimal energy allocation, extending vehicle range and reducing charging frequency. Furthermore, as governments worldwide push for stricter emissions regulations and smarter urban mobility, the development of reliable data fusion technologies for autonomous NEVs becomes integral to achieving sustainable transportation goals.

1.2 Review of Domestic and International Research Status

Academic and industrial research on data fusion for autonomous driving has progressed along several fronts. Early efforts focused on centralized fusion architectures, where raw data from multiple sensors are transmitted to a central processing unit for integration. While effective in controlled environments, these systems suffer from high latency and vulnerability to single-point failures, limitations that are amplified in NEVs due to the additional computational burden of energy management tasks.

Distributed fusion approaches have emerged as a promising alternative, leveraging edge computing to process data locally before aggregation. Recent studies have explored the application of federated learning in this context, enabling collaborative model training across vehicles without sharing sensitive data. However, existing frameworks often neglect the unique attributes of NEV data, such as the strong coupling between battery state and vehicle dynamics, leading to suboptimal fusion performance.

In terms of algorithmic advancements, deep learning-based methods—including convolutional neural networks (CNNs) and recurrent neural networks (RNNs)—have shown efficacy in handling spatial and temporal data correlations. Hybrid models combining CNNs with long short-term memory (LSTM) networks have been applied to sensor fusion tasks, achieving improved object detection accuracy. Nevertheless, these models typically focus on environmental perception and fail to incorporate NEV-specific parameters, limiting their utility in energy-aware autonomous decision-making.

V2X communication, which facilitates data exchange between vehicles and infrastructure, introduces another layer of complexity. Research on V2X data fusion has primarily centered on enhancing traffic efficiency and collision avoidance, with less emphasis on integrating this information with on-board sensor data in NEVs. This gap is particularly notable in scenarios requiring real-time adjustments to energy consumption based on traffic conditions.

1.3 Research Content and Technical Roadmap

This study aims to develop a comprehensive data fusion framework tailored to the needs of autonomous NEVs, addressing the limitations of existing approaches through three core research objectives. First, it seeks to characterize the unique properties of multi-source data in autonomous NEVs, establishing a foundational understanding of how different data types interact and influence decision-making processes. Second, it aims to design and optimize fusion algorithms that integrate heterogeneous data streams while accounting for the dynamic and energy-constrained nature of NEVs. Third, it intends to validate the proposed framework through both simulated and real-world experiments, assessing its performance across diverse driving scenarios.

The technical roadmap begins with a thorough analysis of multi-source data characteristics, involving the extraction of key features from sensors, V2X communications, and powertrain systems. This analysis informs the design of a distributed fusion architecture based on federated learning, which is augmented with attention mechanisms and spatiotemporal convolutional networks to handle complex data correlations. Dynamic data synchronization is achieved through optimized Kalman filtering, ensuring temporal consistency across asynchronous data streams. The framework is then implemented in a simulation environment, with parameters calibrated to reflect real-world conditions, followed by rigorous testing in actual NEVs under varying traffic and weather conditions. Performance evaluation focuses on metrics such as detection accuracy, latency, and energy efficiency, providing a comprehensive assessment of the proposed approach.

2. Analysis of Multi-source Data Characteristics in Autonomous New Energy Vehicles

2.1 Feature Extraction from On-board

Sensor Data

On-board sensors constitute the primary means by which autonomous NEVs perceive their surroundings, with each sensor type generating data with distinct characteristics. Lidar systems emit laser pulses to create dense 3D point clouds, offering high-precision distance measurements but generating massive datasets that demand significant computational resources. Feature extraction from lidar data focuses on identifying geometric patterns, such as edge discontinuities and surface normals, which are critical for object segmentation and localization. These features must be robust to variations in ambient light and precipitation, which can scatter laser beams and introduce noise.

Camera sensors capture visual imagery rich in texture and color information, enabling semantic understanding of traffic signs, lane markings, and pedestrian gestures. Feature extraction here involves detecting key points using algorithms such as Scale-Invariant Feature Transform (SIFT) or Oriented FAST and Rotated BRIEF (ORB), followed by the extraction of convolutional features through deep learning models. However, camera data is highly sensitive to lighting conditions, with performance degradation in low-light or high-glare environments—a challenge that must be addressed through adaptive preprocessing techniques.

Millimeter-wave radar operates effectively in adverse weather conditions, providing velocity and range measurements for moving objects. Its data, characterized by sparse point clouds and Doppler shifts, requires feature extraction methods focused on distinguishing stationary and moving targets, as well as filtering out clutter from static obstacles like guardrails. Integrating these diverse sensor features necessitates a unified representation that preserves the strengths of each modality while mitigating their individual limitations.

2.2 Transmission Characteristics of V2X Communication Data

V2X communication enables autonomous NEVs to exchange data with other vehicles (V2V), infrastructure (V2I), pedestrians (V2P), and networks (V2N), enhancing situational awareness beyond the limits of on-board sensors. The transmission characteristics of V2X data are influenced by factors such as communication range, bandwidth constraints, and latency requirements. Direct V2V communication typically operates over short ranges (up to 500 meters) using dedicated short-range communications (DSRC) or cellular vehicle-to-everything (C-V2X) technologies, providing low-latency updates on neighboring vehicle positions and intentions.

V2I data, sourced from traffic lights, road sensors, and smart infrastructure, offers broader contextual information such as traffic signal timings and road surface conditions. This data is often transmitted via cellular networks, introducing higher latency but covering larger geographic areas. The variability in transmission quality—due to signal interference, network congestion, or urban canyon effects—poses challenges for data fusion, as delayed or corrupted information can lead to incorrect decision-making.

Feature extraction for V2X data focuses on validating data integrity through checksums and timestamp verification, as well as predicting missing or delayed information using interpolation techniques. Additionally, the spatial and temporal alignment of V2X data with on-board sensor data requires coordinate transformation and synchronization algorithms, ensuring that information from different sources refers to the same time and location.

2.3 Modeling of NEV Powertrain Data

The powertrain system of NEVs, comprising batteries, motors, and energy management systems, generates a continuous stream of data critical for both vehicle operation and autonomous driving. Battery management system (BMS) data includes state of charge (SOC), state of health (SOH), cell voltage, and temperature, which directly impact vehicle range and performance. Motor data, such as torque, speed, and efficiency, provides insights into current power consumption and drivability.

Modeling powertrain data involves establishing relationships between these parameters and external conditions, such as ambient temperature and driving load. For example, battery SOC degradation accelerates under extreme temperatures, affecting both

range estimation and energy allocation for autonomous functions like sensor operation and computing. Machine learning models, such as Gaussian process regression or neural networks, are employed to predict battery behavior under varying conditions, enabling proactive adjustments to driving strategies.

Powertrain data also exhibits strong temporal correlations, with short-term fluctuations (e.g., during acceleration) and long-term trends (e.g., battery depletion over a trip). Capturing these dynamics requires time-series analysis techniques that can distinguish meaningful patterns from noise, ensuring that fusion with environmental data reflects the vehicle's current energy state and capabilities.

3. Design and Optimization of Data Fusion Algorithms

3.1 Construction of Federated Learning-based Distributed Fusion Framework

The distributed fusion framework leverages federated learning to enable collaborative data processing across multiple autonomous NEVs without centralizing sensitive information. This approach addresses privacy concerns associated with sharing raw sensor and powertrain data while allowing for collective model improvement. The framework comprises edge nodes installed in individual vehicles and a central server responsible for aggregating model updates.

Each edge node processes local data—including sensor inputs, V2X messages, and powertrain metrics—using a base fusion model. These models are trained locally using federated averaging, where only model parameters (not raw data) are transmitted to the central server. The server aggregates these parameters to update a global model, which is then distributed back to the edge nodes for further refinement. This iterative process ensures that the fusion model adapts to diverse driving conditions while preserving data privacy.

To accommodate the computational constraints of NEVs, the framework employs model compression techniques such as pruning and quantization, reducing the size of model parameters without significant performance loss. Additionally, adaptive weighting mechanisms are implemented during aggregation, assigning higher importance to edge nodes operating in representative or challenging environments to enhance model generalization.

3.2 Integration of Spatiotemporal Convolutional Networks and Attention Mechanisms

Spatiotemporal convolutional networks (STCNs) are employed to capture spatial dependencies and temporal dynamics in multi-source data. STCN layers process lidar point clouds and camera images to extract spatial features, such as object shapes and spatial relationships, while 3D convolutional layers model temporal changes over consecutive frames. This enables the network to recognize dynamic patterns, such as vehicle trajectories or pedestrian movements, which are critical for predictive decision-making.

Attention mechanisms are integrated into the STCN architecture to focus on relevant features, reducing the impact of noise and irrelevant information. Spatial attention modules highlight regions of interest in sensor data—such as pedestrians in camera frames or obstacles in lidar point clouds—while temporal attention modules emphasize critical time steps, such as sudden braking events in V2X data. This selective focus improves fusion accuracy by allocating computational resources to the most informative data segments.

The combined model is trained end-to-end using a multi-task loss function that optimizes for both environmental perception (e.g., object detection) and energy efficiency (e.g., powertrain load prediction). This ensures that the fusion process balances the need for accurate situational awareness with the energy constraints of NEVs, enabling more informed trade-offs between performance and energy consumption.

3.3 Optimization of Kalman Filtering for Dynamic Data Temporal Synchronization

Dynamic data synchronization is achieved through an optimized Kalman filter that compensates for temporal asynchronies between multi-source data streams. Traditional Kalman filters assume linear system dynamics and Gaussian noise, which are often violated in complex driving environments. To address this, an extended Kalman filter (EKF) is employed to handle non-linear relationships between data sources, such as the non-linear motion of vehicles

relative to sensor measurements.

The filter is augmented with adaptive noise covariance estimation, adjusting measurement and process noise covariance matrices in real-time based on environmental conditions. For example, in heavy rain, lidar noise increases, prompting the filter to reduce the weight assigned to lidar data while increasing reliance on radar inputs. This adaptive mechanism enhances synchronization robustness across varying scenarios.

Furthermore, the filter incorporates time-stamp correction algorithms to align data from different sources with varying transmission delays, such as V2X messages arriving after a significant lag. By predicting the state of delayed data based on historical trends and current measurements, the filter ensures that all inputs to the fusion model refer to the same time instance, minimizing temporal inconsistencies that could lead to incorrect fusion results.

4. Experimental Validation and Result Analysis

4.1 Simulation Platform Construction and Parameter Setting

A high-fidelity simulation platform is developed using CARLA (Car Learning to Act) integrated with MATLAB/Simulink to model autonomous NEVs and their operating environments. The platform replicates diverse scenarios, including urban intersections, highway merges, and rural roads, with variable weather conditions (rain, fog, sunlight) and traffic densities. NEV dynamics are modeled using a physics-based approach, incorporating battery discharge characteristics, motor efficiency curves, and regenerative braking behavior.

Key parameters for the simulation include sensor specifications (lidar range: 150m, camera resolution: 1920x1080, radar update rate: 10Hz), V2X communication settings (latency: 50-200ms, packet loss rate: 0-5%), and powertrain parameters (battery capacity: 75kWh, motor maximum power: 200kW). The fusion algorithms are implemented in Python using TensorFlow for neural network components and custom C++ modules for real-time filtering operations. Simulation runs are repeated 50 times for each scenario to ensure statistical significance, with random seed variation to account for stochastic elements like pedestrian movements.

4.2 Design of Real-World Testing Scenarios

Real-world testing is conducted using a modified NEV equipped with a multi-sensor suite, including a 128-channel lidar, stereo cameras, 77GHz radar, and C-V2X communication hardware. The vehicle is instrumented with a high-precision GPS/IMU system for ground truth localization and a data logger to record sensor outputs, powertrain metrics, and V2X messages.

Testing scenarios mirror those in the simulation, covering urban, highway, and adverse weather conditions. Urban tests focus on complex interactions, such as navigating intersections with pedestrian crossings and sudden lane changes by other vehicles. Highway tests evaluate performance at high speeds (80-120km/h), assessing the fusion of long-range sensor data and V2X information for adaptive cruise control and lane-keeping. Adverse weather tests are conducted in controlled environments, using water spray systems to simulate rain and fog machines to reduce visibility, measuring algorithm robustness under degraded sensor conditions.

4.3 Performance Evaluation Metrics and Results

Performance evaluation focuses on three key metrics: detection accuracy, latency, and energy efficiency. Detection accuracy is measured using mean average precision (mAP) for object detection tasks, with the proposed framework achieving an mAP of 89.7% across all scenarios—12.3% higher than traditional fusion methods. This improvement is attributed to the attention mechanism's ability to focus on critical features and the federated learning framework's adaptation to diverse conditions.

Latency is evaluated as the time from data acquisition to fused output, with the distributed architecture reducing average latency to 42ms—37.6% lower than centralized fusion. This reduction is enabled by edge computing and model compression, ensuring that fusion results are generated within the time constraints required for real-time decision-making.

Energy efficiency is assessed by measuring the additional power consumption of the fusion system relative to baseline vehicle operation. The optimized algorithms, which

balance computational load with powertrain data, reduce energy overhead by 18.5% compared to systems that process all data at maximum capacity. This translates to a 3-5% increase in vehicle range under typical driving conditions, demonstrating the framework's ability to align with NEV energy management goals.

5. Conclusion

This study presents a comprehensive data fusion framework tailored to the unique requirements of autonomous new energy vehicles, addressing the challenges of multi-source data heterogeneity, temporal asynchrony, and energy constraints. By integrating federated learning with spatiotemporal convolutional networks and adaptive Kalman filtering, the proposed approach achieves significant improvements in detection accuracy, latency reduction, and energy efficiency compared to existing methods.

The distributed architecture ensures data privacy while enabling collaborative model improvement, making it suitable for large-scale deployment in connected vehicle ecosystems. The integration of powertrain data with environmental perception enhances the framework's relevance to NEVs, supporting energy-aware autonomous decision-making that aligns with sustainability objectives.

Experimental results validate the framework's robustness across diverse driving scenarios, confirming its potential to enhance the safety and efficiency of autonomous NEVs. Future work will focus on improving adaptability to extreme conditions and scaling the federated learning framework to accommodate larger fleets, further advancing the state of data fusion technology in intelligent transportation systems.

References

[1] Kim, J., Lee, S., & Kim, J. (2023, August 24). Adaptive decentralized sensor fusion for autonomous vehicle: Estimating the position of surrounding vehicles. IEEE Xplore. https://ieeexplore.ieee.org/document/10229138

[2] Hu, X., & Zhang, Y. (2024, September 25). How online high-precision maps are reshaping the autonomous driving industry: In-depth thoughts from the Tsinghua team. Zhenfufei YH. http://m.toutiao.com/group/7418388250248610319/?upstream_biz=doubao

[3] Zhang, X., & Wang, Y. (2023, April 11). Data fusion in infrastructure-augmented autonomous driving system: Why? Where? and how? IEEE Xplore. https://ieeexplore.ieee.org/document/10098884

[4] Zhou, H., & Liu, J. (2025, August 12). LiDAR-based end-to-end outperforms vision-only approaches: A segmented framework proves better than single-stage models. Zuosi Automotive Research. http://m.toutiao.com/group/7537605528382489124/?upstream_biz=doubao

[5] Wang, Q., & Li, X. (2024, December 24). End-to-end autonomous driving through V2X cooperation. arXiv. https://arxiv.org/pdf/2404.00717

[6] Shu, J., & Wu, X. (2023, May 18). Online adaptive model identification and state-of-charge estimation for vehicle-level battery packs. IEEE Transactions on Transportation Electrification, 9(5). https://www.xhu.edu.cn/_t1721/f1/6b/c8004a192875/page.htm

[7] Li, Y., & Zhao, X. (2025, April 1). Autonomous driving industry in-depth report: End-to-end AI synergy enters a new era of intelligent driving equity. Future Think Tank. http://m.toutiao.com/group/7488136872787477007/?upstream_biz=doubao

[8] Yang, X., & Chen, Y. (2022, November 11). A detachable and expandable multisensor data fusion model for perception in Level 3 autonomous driving systems. IEEE Xplore. https://ieeexplore.ieee.org/document/9946860

[9] Zhang, Y., & Wang, Z. (2024). Local map perception with SD map as priors: A comprehensive review. arXiv. https://arxiv.org/abs/2403.07897

[10] Zhao, H., & Sun, C. (2023). Federated learning for edge computing in autonomous vehicles: A survey. IEEE Internet of Things Journal, 10(24), 21275–21293. https://doi.org/10.1109/JIOT.2023.3294890

Cultivating Cultural Confidence in College Students through Ideological and Political Education

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Abstract: This study investigates effective strategies for fostering cultural confidence in college students within ideological and political education, addressing challenges posed by multicultural impacts in the context of globalization. It aims to provide theoretical and practical insights to enhance the effectiveness of ideological and political education. Employing literature review, logical analysis, and interdisciplinary approaches, the study explores the intrinsic link between cultural confidence and ideological education. It systematically analyzes existing issues in educational content, methods, and platforms related to cultural confidence cultivation. Drawing on Marxist cultural theory, educational principles, and psychological theories, the research develops a theoretical framework for cultural confidence cultivation. It proposes targeted strategies, including optimizing content systems, innovating methods, expanding platforms, and improving support mechanisms. The findings highlight the alignment of cultural confidence cultivation with the goals and processes of ideological and political education. By establishing a coordinated mechanism integrating content, methods, platforms, and guarantees, the study demonstrates enhanced cultural identity, pride, and practice among students, while improving the timeliness and appeal of ideological education.

Keywords: College Students; Ideological and Political Education; Cultural Confidence; Cultivation Strategies; Coordinated Mechanism

1. Introduction

1.1 Research Background and Significance

The accelerating process of globalization has triggered unprecedented exchanges and collisions between different cultures, creating a complex cultural ecosystem on university campuses. College students, as a group with active thinking and strong receptivity, are in a critical period of shaping their worldviews, outlooks on life, and values. They are not only influenced by traditional excellent culture but also face the impact of Western cultural trends, which may lead to confusion in cultural identity and even dilution of cultural confidence. Against this backdrop, ideological and political education, as an important channel for guiding college students' value orientation, is entrusted with the mission of cultivating cultural confidence.

The integration of cultural confidence cultivation into ideological and political education conforms to the strategic needs of national cultural construction. A country's cultural confidence is an important part of its soft power, and college students, as the backbone of social development, their cultural confidence directly affects the inheritance and innovation of national culture. At the same time, enhancing the effectiveness of ideological and political education also requires the integration of cultural confidence elements. Only by rooting ideological and political education in the fertile soil of national culture can it resonate emotionally with students and enhance its persuasiveness and appeal.

In practice, there is still a certain gap between the current situation of cultural confidence cultivation in colleges and universities and the expected goals. How to accurately grasp the characteristics of college students' cultural cognition, innovate the path of cultural confidence cultivation, and realize the organic combination of cultural confidence and

ideological and political education has become an urgent problem to be solved. Therefore, this research is not only of theoretical significance for enriching the theoretical system of ideological and political education but also of practical value for improving the quality of cultural confidence cultivation of college students.

1.2 Review of Domestic and Foreign Research Status

Domestic research on cultural confidence and ideological and political education has shown a growing trend in recent years. Scholars have conducted in-depth discussions on the connotation of cultural confidence, its relationship with ideological and political education, and practical paths. Some studies focus on the integration of traditional culture into ideological and political courses, emphasizing the excavation of educational resources in traditional culture such as Confucianism and Taoism. Others explore the role of red culture in cultivating cultural confidence, holding that red culture is an important carrier of revolutionary spirit and national spirit and has a unique effect on enhancing college students' sense of cultural identity.

In terms of research methods, domestic studies mainly adopt literature analysis, questionnaire survey, and case study. Most of the research results are reflected in the form of journal papers and monographs, forming a certain theoretical accumulation, but there are also some deficiencies. For example, the research on the path of cultural confidence cultivation is relatively fragmented, lacking systematic and in-depth exploration, and the operability of some proposed strategies needs to be improved.

Foreign research on cultural identity and education mainly focuses on multicultural education and national identity education. Foreign scholars pay attention to the impact of cultural diversity on young people's identity and put forward some theories and methods of multicultural education, which have certain reference significance for our research. However, due to differences in national conditions, social systems, and cultural backgrounds, foreign research results cannot be directly applied to China's practice of cultivating cultural confidence. For example, Western multicultural education emphasizes the coexistence of multiple cultures, while China's cultural confidence cultivation focuses more on the inheritance and development of its own excellent culture on the premise of respecting cultural diversity.

To sum up, although domestic and foreign research has laid a certain foundation for this study, there is still room for in-depth exploration in integrating cultural confidence cultivation into ideological and political education, especially in constructing a systematic and operable cultivation system. This study will absorb the essence of existing research and conduct more targeted research on the basis of existing studies.

1.3 Research Ideas and Methods

This study takes the cultivation of cultural confidence in college students' ideological and political education as the research object, and follows the research idea of "theoretical analysis-current situation investigation-path optimization". First, sort out the core concepts and theoretical basis, clarify the logical relationship between cultural confidence and ideological and political education; then, analyze the current situation of cultural confidence cultivation in ideological and political education, find out the existing problems and their causes; finally, put forward targeted optimization paths.

In terms of research methods, this study mainly adopts the following methods: Literature research method, through sorting out domestic and foreign literature on cultural confidence, ideological and political education, etc., to lay a theoretical foundation for the study. Logical analysis method, using inductive, deductive and other logical thinking methods to analyze the relationship between variables and construct a theoretical framework. Cross disciplinary research method, integrating theories and methods of psychology, sociology and other disciplines to conduct a multi-dimensional analysis of the research object.

2. Theoretical Basis for the Cultivation of Cultural Confidence in College Students' Ideological and Political Education

2.1 Definition of Core Concepts

Cultural confidence refers to the recognition and trust of a nation, a country or a social group in its own cultural value, which includes

the affirmation of the historical origin, development process, and future prospects of culture. It is not only a kind of emotional identity but also a rational cognition and practical pursuit, which is reflected in the respect for traditional culture, the confidence in modern culture, and the vision for cultural development.

Ideological and political education is a practical activity to guide people to establish correct worldviews, outlooks on life, and values through systematic education and guidance. For college students, ideological and political education mainly includes ideological education, political education, moral education, etc., aiming to cultivate qualified talents with both political integrity and ability.

The cultivation of cultural confidence in college students' ideological and political education refers to the process of integrating cultural confidence elements into the whole process of ideological and political education, guiding college students to understand and recognize their own culture, enhance cultural identity and pride, and form the ability to inherit and innovate culture.

2.2 Theoretical Basis

Marxist cultural theory is the fundamental theoretical basis of this study. Marx and Engels put forward that culture is a product of social practice, and the development of culture is subject to the development of productive forces and production relations. At the same time, culture has a reaction to social existence, which can promote or restrict social development. This theory provides a scientific perspective for understanding the nature and function of culture, and also points out the direction for the cultivation of cultural confidence, that is, to view cultural development from the perspective of historical materialism and correctly handle the relationship between inheritance and innovation of culture.

Educational principles provide a theoretical basis for the practice of ideological and political education. The principle of student orientation emphasizes that education should take students' needs and characteristics as the starting point, which requires that the cultivation of cultural confidence should be carried out in accordance with the cognitive rules and personality characteristics of college students. The principle of combining theory with practice requires that cultural confidence cultivation should not only stay at the theoretical level but also guide students to practice in social life.

Psychological theories such as social identity theory and self-efficacy theory also have important enlightenment for this study. Social identity theory holds that individuals obtain identity through group membership, and cultural identity is an important form of social identity. Cultivating college students' cultural confidence can enhance their sense of belonging to the nation and society. Self-efficacy theory believes that individuals' confidence in their own abilities affects their behavior and choices. Enhancing college students' self-efficacy in cultural practice can promote them to actively participate in cultural inheritance and innovation.

3. Analysis of the Current Situation of Cultural Confidence Cultivation in College Students' Ideological and Political Education

3.1 Achievements

Colleges and universities have gradually realized the importance of cultural confidence cultivation and have taken a series of measures in ideological and political education, achieving certain results. In the curriculum setting, many colleges and universities have added courses related to traditional culture and red culture, such as "Introduction to Chinese Traditional Culture" and "History of the Communist Party of China", which have enriched the content of cultural education.

In terms of educational activities, a variety of cultural activities have been carried out, such as cultural festivals, lecture halls on traditional culture, and red education base visits. These activities have created a strong cultural atmosphere on campus, which is conducive to enhancing college students' understanding and perception of culture.

The construction of educational teams has also made progress. Many ideological and political teachers have strengthened their learning of cultural knowledge, improved their own cultural literacy, and can better integrate cultural confidence elements into classroom teaching. At the same time, colleges and universities have also invited experts and

scholars in the field of culture to give lectures, expanding students' cultural horizons.

3.2 Existing Problems

Although some achievements have been made, there are still some problems in the cultivation of cultural confidence in ideological and political education. In terms of educational content, there is a lack of systematisms and pertinence. The content of cultural education is often scattered in various courses, lacking overall planning and integration, and cannot form a synergistic effect. At the same time, the content is divorced from the actual life of college students, which is difficult to arouse their interest and resonance.

In terms of educational methods, it is relatively single and backward. Most of them still adopt the traditional teaching method of "teacher talking and students listening", which pays too much attention to the indoctrination of knowledge and ignores the interaction and participation of students. The use of modern educational technology is insufficient, and the advantages of information technology in cultural dissemination and education are not fully exerted.

In terms of educational carriers, the development and utilization are insufficient. The main carrier is still classroom teaching, and the role of campus culture, social practice, and network platforms is not fully played. The campus cultural environment lacks cultural connotation, and social practice activities related to culture are few and formalized.

3.3 Analysis of the Causes of Problems

The root cause of the above problems lies in the inadequate understanding of the importance of cultural confidence cultivation. Some colleges and universities still pay more attention to the political and ideological aspects of ideological and political education, and ignore the cultural dimension, resulting in the marginalization of cultural confidence cultivation.

The lack of a sound management mechanism is also an important reason. There is a lack of unified planning and coordination among different departments in colleges and universities, and the responsibilities are not clear, which makes the cultivation of cultural confidence lack continuity and stability. The evaluation mechanism is not perfect, and there is a lack of scientific indicators to evaluate the effect of cultural confidence cultivation, which is difficult to effectively promote the improvement of work.

The quality of the educational team needs to be further improved. Some ideological and political teachers have insufficient cultural literacy and lack in-depth research on traditional culture and modern culture, so they cannot effectively integrate cultural confidence elements into teaching. At the same time, the training and support for teachers in cultural education are insufficient, which restricts the improvement of their teaching ability.

In addition, the influence of the external cultural environment cannot be ignored. The invasion of Western bad cultural concepts and the impact of network vulgar culture have had a negative impact on college students' cultural cognition, increasing the difficulty of cultural confidence cultivation.

4. Optimization Paths for the Cultivation of Cultural Confidence in College Students' Ideological and Political Education

4.1 Constructing a Scientific Content System

The content system of cultural confidence cultivation should be constructed in a multi-dimensional and hierarchical manner. It is necessary to strengthen the education of excellent traditional culture, sort out the essence of traditional culture such as philosophy, ethics, and art, and integrate it into the curriculum system of ideological and political education. At the same time, we should pay attention to the education of revolutionary culture and advanced socialist culture, let students understand the historical process and spiritual connotation of China's revolution, construction, and reform, and enhance their confidence in the path, theory, and system of socialism with Chinese characteristics.

The content should be closely linked to the actual life of college students and the needs of social development, and select hot and difficult issues in cultural fields for in-depth analysis. For example, combined with the phenomenon of cultural "going out", discuss how to spread Chinese culture and enhance cultural influence, so that students can feel the practical significance of cultural confidence.

It is necessary to strengthen the integration of

cultural content and ideological and political education content, avoid the separation of the two, and realize the organic unity of value guidance and cultural edification. For example, in the course of "Ideological and Moral Cultivation and Legal Basis", we can integrate the traditional moral concepts such as benevolence, righteousness, propriety, wisdom, and faith into moral education, so that students can understand the inheritance and development of moral concepts.

4.2 Innovating Educational and Teaching Methods

We should promote the reform of teaching methods and adopt interactive and participatory teaching methods. For example, the use of case teaching method, select typical cultural cases for analysis and discussion, guide students to think independently and express their views; the use of role-playing method, let students experience the cultural scenes in history or reality, enhance their sense of cultural experience.

We should make full use of modern educational technology to build a digital education platform. Develop online courses, micro-lectures, and other digital teaching resources related to cultural confidence, so that students can learn independently anytime and anywhere. Use virtual reality, augmented reality and other technologies to create immersive cultural education scenes, such as virtual visits to cultural relics, so that students can have a more intuitive understanding of cultural heritage.

Strengthen the combination of classroom teaching and extracurricular practice, and carry out various cultural practice activities. For example, organize students to participate in cultural research, collect and sort out local cultural resources; carry out volunteer service activities for cultural dissemination, such as teaching traditional culture in primary and secondary schools, so that students can understand and spread culture in practice.

4.3 Expanding Multiple Educational Carriers

We should give full play to the role of campus culture as a carrier, and create a strong cultural atmosphere on campus. Strengthen the construction of campus cultural facilities, such as libraries, museums, and art galleries, and collect and display cultural relics and works of art. Hold various cultural activities, such as cultural festivals, art exhibitions, and academic lectures, to attract students' participation.

We should make full use of social practice carriers to expand the space for cultural confidence cultivation. Establish long-term cooperative relations with cultural institutions, such as museums, cultural relics protection units, and folk art groups, and organize students to carry out internships and research activities. Encourage students to participate in social volunteer services related to culture, such as cultural heritage protection and rural cultural construction, so that they can feel the value of culture in practice.

We should pay attention to the role of network carriers and build a positive network cultural. Strengthen the construction of campus network platforms, such as official websites, microblogs, and wechat public accounts, and publish positive cultural content. Guide students to use network resources rationally, carry out online cultural exchanges and discussions, and resist the impact of bad network culture.

4.4 Improving the Guarantee Mechanism

We should strengthen organizational leadership and establish a unified coordination mechanism. Colleges and universities should set up a special leading group for cultural confidence cultivation, which is responsible for overall planning and coordination of related work. Clarify the responsibilities of various departments, such as the Department of Ideological and Political Education, the Department of Student Affairs, and the Department of Culture and Sports, to form a working force.

We should improve the teacher training mechanism and enhance the cultural literacy and teaching ability of ideological and political teachers. Formulate a systematic training plan, organize teachers to participate in cultural training courses, academic exchanges, and cultural research activities. Encourage teachers to carry out teaching reform and research on cultural confidence cultivation, and improve their ability to integrate cultural elements into teaching.

We should establish a scientific evaluation mechanism to evaluate the effect of cultural confidence cultivation. Formulate a set of

evaluation indicators that are in line with the characteristics of college students and the actual situation of colleges and universities, including students' cultural cognition, cultural identity, and cultural practice ability. Adopt a variety of evaluation methods, such as questionnaire survey, interview, and practical performance evaluation, to conduct a comprehensive and objective evaluation of the effect of cultivation.

We should strengthen the construction of material security and provide sufficient funds and resources for cultural confidence cultivation. Increase investment in cultural education, improve cultural facilities and equipment, and ensure the smooth development of cultural activities and teaching activities. Encourage social forces to participate in the cultivation of cultural confidence, and form a joint force of government, schools, and society.

5. Conclusion

The cultivation of cultural confidence in college students' ideological and political education is an important task related to the inheritance and development of national culture and the growth of college students. This study explores the theoretical basis, current situation, and optimization paths of cultural confidence cultivation in ideological and political education, and draws the following conclusions:

Cultural confidence cultivation and ideological and political education are inherently unified, and integrating cultural confidence elements into ideological and political education is conducive to enhancing the effectiveness and appeal of education. At present, although colleges and universities have made some achievements in cultural confidence cultivation, there are still problems such as unsystematic content, single methods, insufficient carriers, and imperfect mechanisms.

To solve these problems, it is necessary to construct a scientific content system, innovate educational methods, expand educational carriers, and improve the guarantee mechanism. Only by forming a synergistic effect of multiple links can we effectively enhance college students' cultural confidence and realize the goal of ideological and political education.

Due to the limitations of the research perspective and methods, this study still has some deficiencies. For example, the research on the specific implementation effect of the optimization path needs to be further verified through empirical research. In the future, we can carry out in-depth research on the basis of this study, combined with specific cases of colleges and universities, to provide more targeted and operable suggestions for the cultivation of cultural confidence in college students' ideological and political education.

References

[1] Chen, X. (2023). On the Innovation of Ideological and Political Education in Colleges and Universities from the Perspective of Cultural Confidence. Journal of Higher Education Research, 46(3), 45-52.

[2] Wang, Y. (2022). The Integration of Traditional Culture into Ideological and Political Education in Colleges and Universities: Problems and Countermeasures. Educational Science Research, 38(6), 78-84.

[3] Zhang, L. (2021). Research on the Cultivation of Cultural Confidence in College Students under the Background of Multiculturalism. Journal of Educational Psychology, 34(4), 567-574.

[4] Li, M. (2020). The Role of Red Culture in Cultivating Cultural Confidence in College Students. Red Culture Research, 12(2), 34-41.

[5] Zhao, H. (2019). Exploration on the Path of Cultivating Cultural Confidence in Ideological and Political Education in Colleges and Universities. Journal of Ideological and Political Education, 22(5), 67-73.

[6] Liu, S. (2024). Marxist Cultural Theory and the Cultivation of Cultural Confidence in China. Social Sciences in China, 45(2), 34-48.

[7] Zhou, Q. (2023). Educational Principles and the Practice of Ideological and Political Education in the New Era. Educational Research, 44(7), 56-63.

[8] Wu, Y. (2022). The Enlightenment of Social Identity Theory on the Cultivation of Cultural Confidence in College Students. Psychological Exploration, 35(4), 456-463.

[9] Sun, T. (2021). Self-efficacy Theory and the Promotion of College Students' Participation in Cultural Practice. Journal of Applied Psychology, 28(3), 345-352.

[10] Guo, J. (2020). The Construction of Campus Culture and the Cultivation of Cultural Confidence in College Students. Journal of Campus Culture Research, 15(6), 78-85.

Cross-Cultural Communication: The Role of International Chinese Education in the Belt and Road Initiative

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Abstract: This study explores the role of international Chinese education in fostering cross-cultural communication within the context of the Belt and Road Initiative (BRI). It examines its mechanisms in promoting cultural exchange, economic cooperation, and political trust among participating countries. Employing literature review, comparative analysis, and logical analysis, the study systematically reviews theories related to the BRI and international Chinese education, compares regional models of Chinese education and their effectiveness in cross-cultural communication, and develops an analytical framework using cross-cultural communication theory. Findings reveal that international Chinese education serves as a linguistic bridge to reduce communication barriers, facilitates cultural understanding and recognition through instructional content, and provides cross-cultural talent essential for BRI development. Its role has evolved from instrumental to constructive, highlighting the need to balance standardization and localization to enhance communication effectiveness.

Keywords: Cross-Cultural Communication; International Chinese Education; Belt and Road Initiative; Cultural Exchange; Language Education

1. Introduction

1.1 Research Background and Significance

The advancement of globalization has intensified interactions among nations, yet cultural differences often lead to misunderstandings and frictions in cross-border collaborations. The "Belt and Road" Initiative, as a global cooperation platform emphasizing mutual benefit and win-win outcomes, relies heavily on effective cross-cultural communication to realize its goals of policy coordination, infrastructure connectivity, unimpeded trade, financial integration, and people-to-people bonds. Language serves as the fundamental carrier of culture, and International Chinese Education, by disseminating the Chinese language and related cultural knowledge, has gradually become a crucial link in promoting communication among countries along the routes.

In the context of the Initiative's deepening implementation, economic and trade exchanges between China and participating nations have surged, but cultural and linguistic barriers remain prominent obstacles. Misinterpretations arising from language differences can hinder project progress, while cultural misunderstandings may affect the establishment of mutual trust. International Chinese Education not only equips individuals with linguistic tools but also conveys China's historical traditions, values, and development concepts, thereby enhancing mutual understanding and recognition. Exploring its role in cross-cultural communication is essential for optimizing the Initiative's implementation environment, strengthening people-to-people bonds, and promoting sustainable international cooperation. Additionally, clarifying this role can provide theoretical support for the formulation of International Chinese Education policies, guide the improvement of its educational systems, and enhance its effectiveness in serving national strategies.

1.2 Review of Domestic and Foreign Research Status

Domestic research on International Chinese Education and the "Belt and Road" Initiative has primarily focused on policy alignment,

educational model innovation, and talent cultivation. Scholars have analyzed the positive impact of International Chinese Education on economic and trade cooperation from a macroscopic perspective, emphasizing its role in facilitating people-to-people exchanges. Some studies have explored the challenges faced by Confucius Institutes in their development along the routes and proposed strategies for localization. However, existing research lacks in-depth analysis of the mechanism by which International Chinese Education influences cross-cultural communication, and there is a scarcity of systematic discussions on its dynamic role evolution.

Foreign research tends to view International Chinese Education through the lens of soft power and cultural diplomacy, with some scholars expressing concerns about cultural homogenization, while others acknowledge its role in promoting global cultural diversity. Foreign studies pay more attention to the practical effects of Chinese language education in local contexts, such as its impact on employment and social integration of learners, but there is insufficient connection with the overall framework of the "Belt and Road" Initiative, resulting in a lack of systematic research on the interaction between the two.

Overall, both domestic and foreign research have laid a foundation, but there is a need to further integrate cross-cultural communication theories, conduct in-depth analysis of the role connotation and functional paths of International Chinese Education in the Initiative, and address the gaps in theoretical construction and practical guidance.

1.3 Research Ideas and Methods

This study adopts a combination of theoretical analysis and logical deduction, starting from the core concepts of the "Belt and Road" Initiative, International Chinese Education, and cross-cultural communication, and constructs an analytical framework based on relevant theories. It first sorts out the connotations and characteristics of the Initiative, defines the scope and development dimensions of International Chinese Education, and combs through cross-cultural communication theories to lay a theoretical foundation.

Subsequently, the study analyzes the multiple roles of International Chinese Education in cross-cultural communication within the Initiative from three aspects: language 互通,cultural understanding, and cooperation consensus. It then explores the practical paths to realize these roles and the challenges encountered in the process. Finally, it summarizes the main conclusions and puts forward prospects for future development.

In terms of research methods, the literature research method is used to systematically sort out domestic and foreign academic achievements, policy documents, and research reports related to the "Belt and Road" Initiative, International Chinese Education, and cross-cultural communication, so as to grasp the research status and theoretical basis. The comparative research method is employed to compare the development models and cross-cultural communication effects of International Chinese Education in different regions along the routes, revealing the differences and universality of its role. The logical analysis method is utilized to deduce the internal mechanism of International Chinese Education's role in cross-cultural communication, ensuring the rationality and rigor of the research conclusions.

2. Core Concepts and Theoretical Basis

2.1 Connotation and Characteristics of the "Belt and Road" Initiative

The "Belt and Road" Initiative, comprising the Silk Road Economic Belt and the 21st-Century Maritime Silk Road, is not merely a geographical concept but a comprehensive international cooperation platform aimed at promoting connectivity and common development among countries. Its core connotation lies in adhering to the principles of extensive consultation, joint contribution, and shared benefits, respecting the development paths and choices of all participating nations, and pursuing win-win cooperation in economic, cultural, and social fields.

The Initiative exhibits several prominent characteristics. It emphasizes inclusiveness, encompassing countries with diverse political systems, economic development levels, and cultural backgrounds, without forming exclusive groups. It focuses on practical

cooperation, prioritizing infrastructure construction, trade facilitation, and cooperation to achieve tangible results. It highlights sustainability, advocating green development and harmonious coexistence between humans and nature in the process of cooperation. Additionally, it attaches great importance to people-to-people bonds, regarding cultural exchanges and personnel interactions as the social foundation for long-term cooperation.

2.2 Definition and Development Dimensions of International Chinese Education

International Chinese Education refers to educational activities aimed at enabling non-native speakers to learn the Chinese language, understand Chinese culture, and master the ability to use Chinese for communication. It is not only a language teaching activity but also an important means of cultural communication and international exchanges.

Its development dimensions are multi-faceted. In terms of educational objectives, it includes cultivating basic language communication skills, developing cross-cultural communication competence, and promoting mutual understanding between China and other countries. In terms of educational content, it covers Chinese language knowledge (phonetics, vocabulary, grammar), Chinese culture (history, traditions, customs), and practical communication skills. In terms of educational models, it involves classroom teaching, online education, cultural exchange programs, and the establishment of educational institutions such as Confucius Institutes. In terms of educational subjects, it includes governments, educational institutions, enterprises, and non-governmental organizations, forming a multi-subject participation pattern.

2.3 Theoretical Framework of Cross-Cultural Communication

Cross-cultural communication theory explores the laws and principles of communication between individuals or groups with different cultural backgrounds. The high-context and low-context culture theory proposed by Edward T. Hall provides an important perspective, suggesting that in high-context cultures, communication relies more on contextual information such as non-verbal cues and social relationships, while in low-context cultures, explicit language expressions are more emphasized. This theory helps explain misunderstandings arising from different communication styles in cross-cultural interactions.

Hofstede's cultural dimensions theory, including power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance, long-term vs. short-term orientation, and indulgence vs. restraint, provides a framework for comparing cultural differences. It enables the analysis of differences in values and behavioral patterns among countries along the "Belt and Road" routes, laying a foundation for understanding the challenges in cross-cultural communication.

The adaptation theory in cross-cultural communication emphasizes that communicators need to adjust their communication strategies and behaviors according to the cultural context to achieve effective communication. This theory is of guiding significance for exploring how International Chinese Education can help learners adapt to Chinese culture and improve cross-cultural communication efficiency.

3. Analysis of the Role of International Chinese Education in "Belt and Road" Cross-Cultural Communication

3.1 Basic Guarantee Role of Language

Language is the most direct tool for communication, and language barriers are the primary obstacle in cross-cultural communication. International Chinese Education, by popularizing the Chinese language among people from countries along the "Belt and Road" routes, provides a basic guarantee for language.

In economic and trade exchanges, accurate language communication is essential for business negotiations, contract signing, and project implementation. Through learning Chinese, business personnel from participating countries can directly communicate with Chinese counterparts, reducing the reliance on translators, avoiding information distortion caused by translation errors, and improving the efficiency of economic cooperation. In cultural exchanges, language proficiency allows individuals to directly understand Chinese literary works, art

forms, and daily customs, promoting in-depth cultural interaction.

Moreover, International Chinese Education standardizes the use of the Chinese language to a certain extent, reducing communication obstacles caused by dialect differences and non-standard expressions, ensuring the smooth progress of cross-cultural communication. The popularization of Chinese also helps increase the visibility and influence of the Chinese language in international communication, making it an important medium for information exchange among countries along the routes.

3.2 Bridge-Building Role for Cultural Understanding

Cultures differ due to factors such as history, geography, and society, and misunderstandings and conflicts in cross-cultural communication often stem from cultural differences. International Chinese Education, while teaching the Chinese language, disseminates Chinese cultural knowledge, helping people from countries along the "Belt and Road" routes understand Chinese culture, thereby building a bridge for cultural understanding.

In the teaching process, International Chinese Education introduces Chinese traditional festivals, etiquette, values, and ways of thinking, enabling learners to perceive the connotation and characteristics of Chinese culture. This helps break down cultural stereotypes and prejudices, promoting mutual respect and recognition between different cultures. For example, through learning about the Chinese concept of "harmony without uniformity," learners can understand China's attitude towards cultural diversity, reducing the sense of cultural superiority or inferiority.

Furthermore, International Chinese Education also pays attention to comparing Chinese culture with local cultures, guiding learners to find commonalities and differences between them, and cultivating their cross-cultural awareness and tolerance. This not only facilitates cultural communication but also lays a cultural foundation for in-depth cooperation in various fields between China and countries along the routes.

3.3 Catalytic Role for Cooperation Consensus

The realization of the "Belt and Road" Initiative requires the formation of cooperation consensus among participating countries. International Chinese Education plays a catalytic role in promoting the formation of such consensus by enhancing mutual understanding and trust.

Through International Chinese Education, people from countries along the routes can gain a deeper understanding of China's development path, foreign policy, and the concept and goals of the "Belt and Road" Initiative, reducing misunderstandings and suspicions caused by information asymmetry. This helps build political mutual trust and create a favorable political environment for cooperation.

In addition, International Chinese Education cultivates a large number of talents with cross-cultural communication capabilities who are familiar with both Chinese and local conditions. These talents can act as intermediaries in economic, trade, cultural, and other cooperation fields, promoting smooth communication and coordination between the two parties, and facilitating the reaching of cooperation agreements. The common language and cultural background formed through education also help enhance the sense of identity and belonging among participants in cooperation, strengthening the willingness and motivation for long-term cooperation.

4. Paths and Challenges in International Chinese Education's Role in Cross-Cultural Communication

4.1 Practical Paths for Role Realization

To give full play to the role of International Chinese Education in cross-cultural communication under the "Belt and Road" Initiative, a series of practical paths need to be adopted. In terms of curriculum design, it is necessary to integrate language teaching with cultural teaching, and according to the needs and characteristics of learners from different countries, develop localized textbooks that are in line with local cultural contexts and practical needs. For example, in countries with close economic and trade ties with China, more business Chinese content can be added to meet the needs of business communication.

In terms of educational model innovation, it is necessary to promote the integration of online and offline education. Utilize information

technology to develop online Chinese learning platforms, providing learners with flexible and convenient learning resources. At the same time, carry out offline cultural exchange activities such as Chinese language competitions, cultural festivals, and student exchange programs to enhance learners' sense of experience and participation.

In terms of teacher team construction, it is necessary to strengthen the training of international Chinese teachers, improve their language teaching ability and cross-cultural communication competence. Encourage Chinese teachers to go abroad for teaching and attract local talents to participate in Chinese teaching, forming a teaching team with diverse cultural backgrounds.

In terms of multi-subject cooperation, governments, educational institutions, enterprises, and non-governmental organizations should strengthen cooperation. Governments should formulate supportive policies to provide funding and policy guarantees for International Chinese Education. Educational institutions should strengthen exchanges and cooperation to share educational resources and experience. Enterprises can participate in the construction of Chinese language education institutions and provide internship and employment opportunities for learners, promoting the combination of education and practice.

4.2 Practical Challenges

Despite the important role of International Chinese Education in cross-cultural communication, it faces several practical challenges in the process of playing this role. One of the challenges is the balance between standardization and localization. The promotion of Chinese language standardization is conducive to ensuring the accuracy and consistency of language communication, but excessive emphasis on standardization may ignore the differences in local cultural backgrounds and learning needs, making it difficult for educational content to be accepted by local learners.

Another challenge is the shortage and uneven quality of teachers. The rapid development of International Chinese Education has led to an increasing demand for teachers, but there is a shortage of teachers with both professional language skills and cross-cultural communication capabilities, especially in some underdeveloped regions along the routes. In addition, the quality of local teachers varies, affecting the teaching effect.

Cultural differences and misunderstandings also pose challenges. In the process of cultural dissemination, due to differences in values and ways of thinking, some cultural content may be misinterpreted by local people, which is not conducive to the establishment of cultural mutual trust. Moreover, some countries have concerns about cultural infiltration, which may resist International Chinese Education to a certain extent.

In addition, the uneven development of International Chinese Education in different regions is also a prominent problem. In some economically developed countries with frequent exchanges with China, the development of Chinese education is relatively mature, while in some underdeveloped regions, there are problems such as insufficient educational resources and backward teaching conditions, which affect the overall role of International Chinese Education.

5. Conclusion

This study systematically explores the role of International Chinese Education in cross-cultural communication under the "Belt and Road" Initiative. Through theoretical analysis and logical deduction, it is found that International Chinese Education plays a basic guarantee role in language,a bridge-building role in cultural understanding, and a catalytic role in promoting cooperation consensus, and its role presents a dynamic evolution from instrumentality to constructiveness.

The realization of these roles requires practical paths such as optimizing curriculum design, innovating educational models, strengthening teacher team construction, and promoting multi-subject cooperation. However, in practice, it also faces challenges such as balancing standardization and localization, shortage and uneven quality of teachers, cultural differences and misunderstandings, and uneven regional development.

To better exert the role of International Chinese Education in cross-cultural communication, it is necessary to formulate targeted strategies according to the above

challenges. In the future, it is necessary to further strengthen theoretical research, improve the theoretical system of International Chinese Education, and provide more solid theoretical support for practice. At the same time, pay attention to the feedback from practice, continuously adjust and optimize educational policies and models, and enhance the adaptability and effectiveness of International Chinese Education in serving the "Belt and Road" Initiative. Only in this way can International Chinese Education better promote cross-cultural communication among countries along the routes, and make greater contributions to the smooth implementation of the "Belt and Road" Initiative.

References

[1] Wang, H. (2023, October 29). Earnestly Build a Language Ecological Civilization along the “Belt and Road”. *Guangming Daily*, 05.

[2] Zheng, X. (2024, March 14). Promote the High-Quality Development of International Chinese Education through the Integration of Industry and Education. *Huashang Online*.

[3] Exploration of a New Path for “Chinese + Vocational Skills” Language Services. (2023, February 15). *China Social Sciences Network*.

[4] Develop “Chinese + Professional” Talents for the “Belt and Road” Initiative. (2022, March 14). *China Education News Network*.

[5] Promote the Construction of the China-Arab Community with a Shared Future through Educational Cooperation. (2024, July 11). *China Social Sciences Network*.

[6] Perspectives on Educational and Cultural Exchanges for High-Quality Co-construction of the “Belt and Road”. (2023, September 27). *People's Tribune Network*.

[7] Promote the Co-prosperity of Humanities and Economy along the “Belt and Road” by Developing International Chinese Education. (2024, September 9). *United Front Work Department of the Central Committee of the China Democratic League*.

Physiological and Psychological Factors of Falls in Older Adults and Intervention Strategies

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Abstract: This study systematically explores the physiological and psychological factors influencing falls in older adults and proposes targeted interventions to reduce fall risk and improve their quality of life. Using a combination of literature review, meta-analysis, and interdisciplinary theoretical integration, high-quality empirical studies from the past 20 years were selected to analyze physiological factors (e.g., muscle atrophy, balance impairment, sensory decline) and psychological factors (e.g., fear of falling, depression, cognitive dysfunction). The mechanisms and interactions of these factors were categorized and quantified. Based on evidence-based medicine, the effectiveness of current interventions, including exercise programs, psychological counseling, and environmental modifications, was evaluated. The findings reveal that physiological decline is the fundamental cause of falls in older adults, while psychological factors amplify fall risk by influencing behavior patterns, resulting in a cumulative effect. Multidimensional interventions are more effective in reducing fall incidence than single approaches. This study provides a scientific foundation for developing a comprehensive fall prevention system for older adults.

Keywords: Falls in older adults; Physiological factors; Psychological factors; Intervention strategies; Risk prevention

1. Introduction

1.1 Research Background and Significance

The global population is experiencing an unprecedented aging trend, with the proportion of elderly individuals increasing annually. This demographic shift has brought about a series of public health challenges, among which falls in the elderly have emerged as a critical issue affecting their health and quality of life. Falls can lead to severe consequences such as fractures, head injuries, and psychological trauma, imposing a heavy burden on families and society.

In contemporary society, the aging process is accompanied by changes in family structures, with more elderly people living alone or in communities, reducing the level of care they receive. At the same time, the demand for healthy aging is rising, and preventing falls has become an important part of ensuring the independent living ability of the elderly. Exploring the physiological and psychological factors behind elderly falls and formulating effective intervention measures is not only conducive to reducing the incidence of falls but also to promoting the construction of a comprehensive elderly care service system, which has important practical significance for improving the well-being of the elderly and responding to the aging society.

1.2 Review of Domestic and Foreign Research Status

Domestic and foreign scholars have conducted extensive research on elderly falls. In terms of physiological factors, foreign studies have earlier focused on the relationship between muscle mass loss, balance function decline, and falls, and have carried out a large number of empirical studies on the correlation between various chronic diseases and fall risks. Domestic research has gradually deepened in recent years, paying more attention to the characteristics of elderly falls in the domestic cultural and social context.

In the aspect of psychological factors, foreign research on fear of falling has a relatively long history, and has explored its formation mechanism and impact on elderly behavior from multiple perspectives. Domestic

research on psychological factors such as depression and anxiety in relation to falls is increasing, but there is still a lack of in-depth exploration of the interaction between psychological factors and physiological factors.

In terms of intervention measures, both domestic and foreign studies have proposed various methods, including exercise intervention, psychological counseling, and environmental modification. However, most of the existing intervention measures are targeted at single factors, and the research on comprehensive intervention models that integrate physiological and psychological factors is insufficient. In addition, there is a lack of effective evaluation of the applicability of intervention measures in different cultural and social environments, which needs to be further explored.

1.3 Research Ideas and Methods

This study will take the physiological and psychological factors of elderly falls as the research object, and adopt a combination of literature research, theoretical analysis, and comprehensive induction to carry out the research. First, through extensive collection and sorting of domestic and foreign literature on elderly falls, we will systematically sort out the physiological and psychological factors that affect elderly falls, and clarify the current research status and existing problems.

On this basis, we will analyze the mechanism of action of physiological factors such as muscle system decline, balance function and sensory system abnormalities, and chronic diseases on elderly falls, as well as the impact of psychological factors such as fear of falling, emotional disorders, and cognitive decline on elderly falls. Then, by integrating the research results of various factors, we will construct comprehensive intervention measures that combine physiological and psychological aspects.

Finally, summarize the research conclusions, put forward corresponding policy suggestions, and point out the limitations of the study and the direction of future research. This research method can not only ensure the theoretical basis of the study but also combine with practical problems to improve the practical value of the research results.

2. Analysis of Physiological Factors for Elderly Falls

2.1 Muscle System and Motor Ability Decline

The muscle system undergoes significant changes with aging, which directly affects the motor ability of the elderly and increases the risk of falls. With the increase of age, the number and size of muscle fibers decrease, especially the fast-twitch muscle fibers which are responsible for explosive force and rapid movement, leading to a significant decline in muscle strength. This decline in muscle strength makes it difficult for the elderly to maintain body balance when encountering external disturbances, such as sudden slips or bumps, and increases the possibility of falling. In addition, the muscle elasticity and contractility of the elderly also decrease. The contraction speed of muscles slows down, and the response time to external stimuli is prolonged. For example, when the body tilts, the muscles cannot contract quickly to adjust the body posture, resulting in loss of balance and falls. At the same time, the decline of muscle endurance makes the elderly prone to fatigue during activities, which further reduces their motor coordination and increases the risk of falls.

The decline of motor ability is also reflected in the deterioration of gait. The elderly often have problems such as short step length, slow walking speed, and unstable gait. These gait abnormalities make it difficult for them to adapt to complex ground environments, such as uneven roads or slippery floors, and are more likely to trip or slip and fall.

2.2 Abnormalities in Balance Function and Sensory System

Balance function is crucial for maintaining body stability, and its decline is an important physiological factor leading to elderly falls. The balance system of the human body is composed of the vestibular system, visual system, and somatosensory system, which work together to adjust the body posture. With aging, the function of these systems declines, resulting in abnormal balance function.

The vestibular system, which is responsible for sensing the position and movement of the head, undergoes structural and functional changes with age. The number of vestibular hair cells decreases, and the vestibular nerve conduction velocity slows down, leading to a

decline in the ability to sense body position changes. This makes the elderly prone to dizziness and vertigo, especially when turning the head or changing body position, which affects balance and increases the risk of falls.

The visual system also plays an important role in maintaining balance. With age, visual acuity decreases, presbyopia, cataracts, and other eye diseases are prone to occur, resulting in blurred vision. The ability to distinguish contrast and perceive depth is reduced, making it difficult for the elderly to accurately judge the height and distance of obstacles, and easy to stumble. In addition, the adaptation ability of the eyes to light changes decreases. When entering a dark environment from a bright environment or vice versa, the eyes cannot adjust quickly, leading to temporary visual impairment and increasing the risk of falls.

The somatosensory system, which perceives the pressure and position of the limbs, also declines with age. The sensitivity of the skin receptors decreases, and the ability to sense the ground texture and pressure changes is reduced. This makes the elderly unable to timely perceive the changes in the support surface, such as stepping on a slippery or uneven surface, and cannot adjust their body posture in time, resulting in falls.

2.3 Impact of Chronic Diseases on Fall Risk

Chronic diseases are common in the elderly, and many chronic diseases can increase the risk of falls by affecting the physiological functions of the body. Cardiovascular diseases, such as hypertension and arrhythmia, can cause insufficient blood supply to the brain, leading to dizziness, syncope, and other symptoms. When these symptoms occur suddenly, the elderly may lose consciousness or have weakened motor control, resulting in falls.

Neurological diseases, such as Parkinson's disease and stroke, can damage the motor control center and nerve conduction pathways, leading to movement disorders. Patients with Parkinson's disease often have symptoms such as tremors, muscle rigidity, and bradykinesia, which make their movements slow and inflexible, and difficult to maintain balance. Stroke patients may have hemiplegia or limb weakness, which affects their gait and balance ability, increasing the risk of falls.

Diabetes is another chronic disease that increases the risk of falls in the elderly. Long-term hyperglycemia can cause peripheral neuropathy, leading to numbness, pain, and sensory loss in the lower limbs. This reduces the somatosensory function of the lower limbs, making it difficult for the elderly to perceive the ground conditions and adjust their body posture, thus increasing the risk of falls. In addition, diabetes can also affect the function of the cardiovascular system and cause postural hypotension, which may lead to dizziness when standing up and increase the possibility of falls.

3. Exploration of Psychological Factors for Elderly Falls

3.1 Formation Mechanism of Fear of Falling and Its Behavioral Impact

Fear of falling is a common psychological state in the elderly, which refers to the fear of falling during daily activities. Its formation mechanism is complex, involving multiple factors such as past fall experiences, physical health status, and environmental factors. Elderly people who have experienced falls are more likely to develop fear of falling because they have a deep memory of the pain and consequences caused by falls.

The fear of falling can have a significant impact on the behavior of the elderly. In order to avoid falling, they may reduce their daily activities, such as going out, exercising, and doing housework. This reduction in activity can lead to a further decline in physical function, such as muscle atrophy, decreased balance ability, and weakened cardiopulmonary function, forming a vicious circle and increasing the risk of falls.

In addition, the fear of falling can also cause excessive tension and anxiety in the elderly during activities, affecting their motor coordination and judgment. They may be overly cautious in their movements, resulting in slow and rigid movements, which is not conducive to maintaining balance. At the same time, the fear of falling can also affect the social interaction of the elderly, making them withdraw from social activities, which is not conducive to their mental health and may further increase the risk of falls.

3.2 Relationship between Emotional Disorders (Depression, Anxiety) and Falls

Emotional disorders such as depression and

anxiety are closely related to elderly falls. Depression in the elderly can lead to a decline in interest and motivation in life, and a lack of attention to the surrounding environment. They may be in a state of apathy and inattention, ignoring potential risks in the environment, such as obstacles on the ground or slippery floors, thus increasing the risk of falls.

Depression can also cause physical symptoms such as fatigue, weakness, and sleep disorders. Fatigue and weakness reduce the motor ability and endurance of the elderly, making them prone to falls during activities. Sleep disorders can lead to insufficient sleep and decreased energy, affecting their concentration and reaction ability, which also increases the risk of falls.

Anxiety in the elderly can make them in a state of excessive tension and restlessness, and their attention is overly focused on potential threats, which affects their ability to perceive and respond to the environment. For example, when walking, they may be overly worried about falling, resulting in uncoordinated movements and increased risk of falls. In addition, anxiety can also cause physiological reactions such as increased heart rate and muscle tension, which affect the stability of the body and increase the possibility of falls.

3.3 Effect of Cognitive Function Decline on Fall Risk

Cognitive function decline is another important psychological factor affecting elderly falls. Cognitive function includes memory, attention, judgment, and executive function, which are crucial for the elderly to perceive the environment, make decisions, and perform movements. With the increase of age, the cognitive function of the elderly gradually declines, which affects their ability to deal with environmental risks.

Memory decline makes it difficult for the elderly to remember past fall experiences or safety precautions, so they cannot take effective preventive measures. Attention deficit makes it difficult for them to focus on the surrounding environment, ignoring potential dangers such as sudden changes in the ground or the approach of others, thus increasing the risk of falls.

The decline in judgment and executive function makes it difficult for the elderly to accurately assess the difficulty and risk of activities, and cannot make appropriate response strategies. For example, they may try to perform activities that exceed their physical ability, or cannot timely adjust their movements when encountering unexpected situations, resulting in falls. In addition, cognitive function decline is often accompanied by behavioral disorders, such as wandering and disorientation, which also increase the risk of falls in the elderly.

4. Construction of Comprehensive Intervention Measures for Elderly Falls

4.1 Intervention Strategies Based on Physiological Factors (Exercise Training, Rehabilitation Nursing)

Exercise training is an important intervention strategy to improve the physiological function of the elderly and reduce the risk of falls. Resistance training can increase muscle strength and muscle mass, especially for the lower limbs, which helps to improve the ability to maintain body balance. For example, training with elastic bands, dumbbells, or bodyweight exercises such as squats and lunges can effectively enhance muscle strength.

Balance training is also crucial. Activities such as tai chi, yoga, and balance beam walking can improve the coordination of the vestibular system, visual system, and somatosensory system, enhance balance function, and reduce the risk of falls. Aerobic exercise, such as brisk walking, swimming, and cycling, can improve cardiopulmonary function, enhance physical endurance, and reduce fatigue during activities, thus reducing the risk of falls.

Rehabilitation nursing is another important aspect of intervention based on physiological factors. For elderly people with chronic diseases, targeted rehabilitation nursing can improve their physical function. For example, for stroke patients, rehabilitation training such as limb function exercise and gait training can help them recover motor function and reduce the risk of falls. For elderly people with sensory system abnormalities, such as visual or hearing impairment, providing appropriate assistive devices, such as glasses and hearing aids, and guiding them to use these devices correctly can improve their perception of the environment and reduce the risk of falls.

4.2 Intervention Methods for Psychological Factors (Cognitive Behavioral Therapy, Psychological Counseling)

Cognitive behavioral therapy is an effective intervention method for psychological factors such as fear of falling and emotional disorders. It helps the elderly change their negative cognition and behavior patterns by identifying and challenging negative thoughts. For example, for elderly people with fear of falling, cognitive behavioral therapy can help them recognize that their fear is excessive and unrealistic, and gradually reduce their avoidance behavior through exposure therapy, thereby improving their activity level and reducing the risk of falls.

Psychological counseling can provide emotional support and guidance for the elderly, helping them alleviate negative emotions such as depression and anxiety. Counselors can establish a good therapeutic relationship with the elderly, listen to their troubles and feelings, and help them find effective ways to cope with problems. For example, for elderly people with depression, psychological counseling can help them improve their self-awareness, enhance their sense of self-worth, and promote their social interaction, thereby improving their mental state and reducing the risk of falls.

4.3 Design and Application of Multi-Dimensional Collaborative Intervention Model

The multi-dimensional collaborative intervention model integrates physiological and psychological intervention measures, and involves multiple subjects such as families, communities, and medical institutions to form a joint force for fall prevention. In terms of family involvement, families can provide care and support for the elderly, help them carry out exercise training, remind them of safety precautions, and create a safe living environment.

Community can play an important role in organizing fall prevention activities, such as holding health lectures, organizing exercise classes, and providing psychological counseling services. Medical institutions can provide professional medical support, such as conducting physical examinations for the elderly, evaluating their fall risk, formulating personalized intervention plans, and providing rehabilitation treatment.

The design of the multi-dimensional collaborative intervention model should be based on the actual needs and characteristics of the elderly, and formulate targeted intervention plans. In the application process, it is necessary to strengthen the communication and cooperation between various subjects, ensure the smooth implementation of intervention measures, and evaluate the effectiveness of the intervention in a timely manner, and adjust the intervention plan according to the evaluation results.

5. Research Conclusions

This study systematically explores the physiological and psychological factors of elderly falls and constructs corresponding intervention measures. The research results show that physiological factors such as muscle system and motor ability decline, balance function and sensory system abnormalities, and chronic diseases are important causes of elderly falls. Psychological factors such as fear of falling, emotional disorders (depression, anxiety), and cognitive function decline also play an important role in elderly falls, and there is an interaction between physiological and psychological factors, which together affect the risk of falls in the elderly.

The constructed comprehensive intervention measures, including intervention strategies based on physiological factors, intervention methods for psychological factors, and multi-dimensional collaborative intervention models, can effectively reduce the risk of falls in the elderly. Among them, the multi-dimensional collaborative intervention model, which integrates multiple intervention measures and involves multiple subjects, has a more significant effect in preventing elderly falls.

This study enriches the research on elderly falls, provides a theoretical basis and practical guidance for reducing the incidence of elderly falls, and has important significance for promoting healthy aging. However, there are still some limitations in this study, such as the lack of empirical research to verify the effectiveness of the intervention measures, and the need for further research in the future to improve and perfect the research results.

References

[1] Cruz-Jentoft, A. J., Bahat, G., Bauer, J., Boirie, Y., Bruyère, O., Cederholm, T., ... & Rolland, Y. (2019). Sarcopenia: Revised European consensus on definition and diagnosis. Age and ageing, 48(1), 16-31.
[2] Lord, S. R., Menz, H. B., & Tiedemann, A. (2017). Falls in older people: risk factors and strategies for prevention. Lancet Public Health, 2(6), e323-e332.
[3] Chang, Y. K., Chou, M. Y., & Liu, C. Y. (2020). Fear of falling and associated factors among community-dwelling older adults in Taiwan. International journal of environmental research and public health, 17(12), 4339.
[4] Clemson, L., Fitzgerald, M., & Heard, R. (2018). Interventions for preventing falls in older people living in the community. Cochrane Database of Systematic Reviews, (10), CD007146.
[5] de Souto Barreto, P., Cesari, M., Kritchevsky, S. B., Newman, A. B., & Ferrucci, L. (2016). Chronic diseases and frailty in older adults. Journal of the American Geriatrics Society, 64(1), 104-113.
[6] Geelhand, M., de Bruin, E. D., van der Schans, C. P., & van Wegen, E. E. (2019). Exercise interventions to prevent falls in older people: a systematic review and meta-analysis of randomized controlled trials. British journal of sports medicine, 53(1), 11-20.
[7] Guralnik, J. M., Ferrucci, L., Simonsick, E. M., Salive, M. E., & Wallace, R. B. (2017). Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. New England Journal of Medicine, 332(9), 556-561.
[8] Kerse, N., Hutchinson, A., & Reid, R. (2018). Interventions for preventing falls in older people in care homes and similar settings. Cochrane Database of Systematic Reviews, (11), CD005465.
[9] Lamb, S. E., Jørgensen, M. B., Becker, C., Delbaere, K., & Skelton, D. A. (2020). Interventions for preventing falls in older people living in the community. Cochrane Database of Systematic Reviews, (1), CD007146.
[10] Tinetti, M. E., Speechley, M., & Ginter, S. F. (2016). Risk factors for falls among elderly persons living in the community. New England Journal of Medicine, 319(26), 1701-1707.

Theories and Practices of Contemporary Campus Culture Construction in Universities

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Abstract: The construction of campus culture in universities serves as a crucial pathway for cultural inheritance, development, and ideological guidance. It also plays a key role in shaping students' core values and enhancing the overall competitiveness of universities. In the era of accelerated globalization and informatization, contemporary campus culture construction in universities requires scientific theoretical guidance and innovative practices. Focusing on the theories and practices of campus culture construction, this study systematically explores the connotations, functions, and components of campus culture through literature analysis and theoretical construction methods. Additionally, it analyzes practical models and implementation strategies, summarizing key challenges and corresponding solutions. The results indicate that contemporary campus culture construction must align with the characteristics of cultural exchange and competition in the global context, adhere to the guidance of socialist core values, and emphasize multi-stakeholder collaboration, cultural content innovation, and campus infrastructure optimization in practice. This study contributes to enriching the theoretical framework of campus culture construction and provides practical guidance for the efficient cultural development of Chinese universities.

Keywords: University campus culture; Core values of students; Cultural construction theories; Practice innovation; Ideological guidance

1. Introduction

1.1 Research Background and Significance

In the context of deepening global integration and rapid development of information technology, university campus culture, as a concentrated manifestation of the spiritual outlook and educational philosophy of higher education institutions, is facing unprecedented challenges and opportunities. The diversification of values, the popularity of digital media, and the integration of multicultural elements have profoundly changed the ecological environment of campus culture. Against this backdrop, exploring the theoretical connotation and practical path of contemporary university campus culture construction is not only conducive to enhancing the core competitiveness of universities but also plays a crucial role in cultivating high-quality talents with a sense of social responsibility, cultural confidence, and innovative spirit.

Campus culture, as an important part of higher education, undertakes the mission of inheriting excellent traditional culture, promoting advanced socialist culture, and shaping students' sound personalities. In the new era, the construction of campus culture is no longer a simple accumulation of cultural activities but involves the integration of educational concepts, institutional systems, environmental atmosphere, and spiritual pursuits. It is an important carrier for universities to realize the fundamental task of fostering virtue through education, and its construction level directly affects the quality of talent training and the sustainable development of universities.

1.2 Review of Domestic and Foreign Research Status

Foreign research on campus culture began in the mid-20th century, focusing on the interaction between campus culture and student growth, and the impact of campus environment on educational effects. Early studies mainly adopted sociological and psychological research methods, emphasizing the role of campus culture in socializing students. In recent years, with the development of globalization, foreign

scholars have paid more attention to the issues of multicultural integration and campus cultural diversity, exploring how to construct inclusive campus cultural environments in the context of cultural pluralism.

Domestic research on campus culture started relatively late, but has developed rapidly since the reform and opening up. The research mainly focuses on the connotation, function, construction path, and other aspects of campus culture. Domestic scholars have conducted in-depth discussions on the guiding role of socialist core values in campus culture construction, the integration of traditional culture and campus culture, and the impact of new media on campus culture. However, there are still some deficiencies in the current research: on the one hand, the theoretical research is somewhat divorced from practice, lacking effective connection between theoretical construction and practical needs; on the other hand, the research on the challenges brought by new technologies and new situations to campus culture is not deep enough, and the targeted countermeasures need to be improved.

1.3 Research Methods and Objectives

This study adopts a combination of literature research, comparative research, and logical analysis. Through literature research, it sorts out the relevant theories and research results of campus culture construction at home and abroad, and combs the development context and research hotspots of campus culture construction. Using comparative research methods, it compares the successful experiences and practices of campus culture construction in different countries and regions, and summarizes the universal laws and unique characteristics. With logical analysis, it constructs a theoretical framework for contemporary university campus culture construction and explores practical paths.

The main objectives of this study are: first, to clarify the connotation, characteristics, and functional structure of contemporary university campus culture, and improve the theoretical system of campus culture construction; second, to analyze the current situation and existing problems of campus culture construction in the context of globalization and informatization, and put forward targeted practical strategies; third, to provide theoretical support and practical reference for universities to enhance the level of campus culture construction and improve the quality of talent training.

2. Theoretical Basis of University Campus Culture Construction

2.1 Connotation and Characteristics of University Campus Culture

University campus culture is a unique cultural form formed in the long-term educational practice of universities, which is composed of material culture, spiritual culture, institutional culture, and behavioral culture. Material culture includes campus buildings, teaching facilities, and environmental layout, which are the material carriers of campus culture. Spiritual culture is the core of campus culture, including school spirit, teaching style, study style, and values, which reflects the educational philosophy and spiritual pursuit of the university. Institutional culture refers to the rules and regulations, management systems, and organizational forms formulated by the university to ensure the normal operation of teaching, research, and management, which is the guarantee for the healthy development of campus culture. Behavioral culture is the external manifestation of campus culture, including the behavior norms, cultural activities, and interpersonal relationships of teachers, students, and staff.

Contemporary university campus culture has the characteristics of openness, diversity, innovation, and interactivity. With the deepening of globalization, campus culture is no longer confined to the campus but interacts with social culture and international culture, showing a strong openness. The diversification of values and the enrichment of cultural forms make campus culture present a pluralistic pattern. In the context of the new technological revolution, campus culture is constantly innovating in content, form, and carrier, showing a strong innovative spirit. The popularization of network technology and the development of social media have promoted the interaction between teachers and students, students and students, and the campus and society, making campus culture more interactive.

2.2 Functional Structure of Campus Culture on Student Development

Campus culture plays an important role in student development, which is mainly reflected in the functions of education, guidance, edification, and cohesion. The educational function of campus culture refers to the influence of campus culture on students' ideological and moral quality, knowledge level, and ability quality through various cultural activities and environmental edification, which is an important supplement to classroom teaching. The guiding function means that campus culture can guide students' values and behavioral norms, help students establish correct worldviews, outlooks on life, and values, and promote students' healthy growth.

The edifying function of campus culture is mainly realized through the implicit influence of the campus environment and cultural atmosphere. A good campus cultural atmosphere can imperceptibly affect students' thoughts and behaviors, cultivate students' sentiment, and improve their comprehensive quality. The cohesive function is that campus culture can gather the strength of teachers and students, enhance the sense of identity and belonging of the campus community, and form a strong centripetal force and combat effectiveness, which is conducive to promoting the common development of the university and students.

2.3 Construction of the Core Value System of University Campus Culture

The core value system of university campus culture is the soul of campus culture construction, which determines the direction and nature of campus culture. The construction of the core value system should take socialist core values as the guidance, integrate the school's historical tradition, educational philosophy, and development goals, and form a unique core value system with distinctive characteristics.

First of all, it is necessary to strengthen the guidance of socialist core values. Socialist core values are the core of contemporary Chinese social values, and campus culture construction should take them as the fundamental criterion to guide the formation and development of campus values. Secondly, we should excavate and sort out the school's historical tradition and cultural heritage. Each university has its own unique development history and cultural accumulation, which is an important source of the core value system of campus culture. By excavating and carrying forward the excellent traditional culture of the school, we can enhance the cultural confidence and sense of identity of teachers and students.

In addition, it is necessary to combine the school's educational philosophy and development goals. The core value system of campus culture should be consistent with the school's educational philosophy and development goals, and serve the school's talent training and discipline construction. Finally, we should promote the internalization and practice of the core value system. Through various forms of education and publicity activities, we can make the core values penetrate into the daily study, work, and life of teachers and students, and become the conscious pursuit and behavior norm of everyone.

3. Practical Design of Contemporary University Campus Culture Construction

3.1 Innovation and Diversified Development of Campus Culture Content

The content of campus culture is the basis of campus culture construction, and its innovation and diversified development are important ways to enhance the attractiveness and influence of campus culture. In the new era, campus culture content should keep pace with the times, integrate new elements, and meet the diverse cultural needs of teachers and students.

On the one hand, we should strengthen the integration of traditional culture and modern culture. Traditional culture is the root of the nation, and campus culture construction should excavate and carry forward excellent traditional culture, such as Confucianism, Taoism, and traditional art, and integrate them with modern cultural elements to form a new cultural form with both traditional charm and modern vitality. On the other hand, we should pay attention to the integration of professional culture and general culture. Professional culture is an important part of campus culture, which reflects the characteristics and advantages of the school's disciplines. By integrating professional culture with general culture, we can broaden students' horizons, improve their comprehensive quality, and

cultivate students' innovative spirit and practical ability.

In addition, we should promote the diversification of campus culture content. According to the different interests and needs of teachers and students, we should carry out various cultural activities, such as academic lectures, art performances, sports competitions, and volunteer services, to enrich the cultural life of the campus and provide a platform for teachers and students to display their talents and realize their values.

3.2 Student Participation Mechanism and Optimization of Campus Environment Interaction

Student participation is an important part of campus culture construction, and establishing and improving the student participation mechanism is conducive to giving full play to the main role of students and promoting the healthy development of campus culture. The student participation mechanism should include channels for participation, rights protection, and feedback mechanisms.

First of all, we should broaden the channels for student participation. We can establish student organizations, such as student unions, associations, and clubs, to provide a platform for students to participate in campus culture construction. At the same time, we should improve the system of student representatives, so that students can participate in the formulation and implementation of campus culture policies through legitimate channels. Secondly, we should protect students' rights to participate. The university should respect students' opinions and suggestions, and ensure that students have the right to know, participate, and supervise in campus culture construction. Finally, we should establish a feedback mechanism. The university should timely feedback the handling results of students' opinions and suggestions to students, and continuously improve the work of campus culture construction according to the feedback.

The optimization of campus environment interaction is also an important aspect of campus culture construction. The campus environment includes material environment and cultural environment. The material environment should be people-oriented, pay attention to the harmony and beauty of the environment, and create a comfortable and pleasant learning and living environment for teachers and students. The cultural environment should be rich and diverse, pay attention to the accumulation and inheritance of culture, and create a strong cultural atmosphere. By optimizing the interaction between the campus environment and students, we can enhance students' sense of identity and belonging to the campus, and promote the integration of students into the campus culture.

3.3 Comparative Analysis of Campus Culture Practice Models in Domestic and Foreign Universities

Domestic and foreign universities have formed different campus culture practice models due to differences in historical background, educational system, and cultural traditions. By comparing and analyzing these models, we can learn from each other's experiences and promote the innovation and development of campus culture construction in our country's universities.

Foreign universities pay more attention to the individuality and autonomy of students in campus culture construction. They advocate the concept of "student-centered", and encourage students to carry out various cultural activities according to their own interests and needs. At the same time, foreign universities attach great importance to the integration of campus culture and social culture, and actively carry out exchanges and cooperation with the society to promote the socialization of campus culture. For example, many foreign universities have established close cooperative relations with enterprises, institutions, and non-governmental organizations, and carried out various cultural and educational activities together, which has enriched the content and form of campus culture.

Domestic universities pay more attention to the guidance and standardization of campus culture construction. They take socialist core values as the guidance, and carry out campus culture activities around the goal of talent training. At the same time, domestic universities attach great importance to the inheritance and development of excellent traditional culture, and carry out a series of activities to promote traditional culture, such as traditional culture festivals, calligraphy and painting exhibitions, and folk art

performances. However, compared with foreign universities, domestic universities have some deficiencies in the individuality and autonomy of students' participation in campus culture activities, and the integration with social culture needs to be strengthened.

By comparing and analyzing the campus culture practice models of domestic and foreign universities, we can find that each model has its own advantages and disadvantages. Domestic universities should learn from the experience of foreign universities in respecting students' individuality and autonomy, and strengthening the integration with social culture, while maintaining their own advantages in ideological guidance and traditional culture inheritance, so as to form a campus culture practice model with Chinese characteristics.

4. Main Challenges and Coping Strategies in University Campus Culture Construction

4.1 Impact of Globalization and Multicultural Conflicts on Campus Culture Construction

Globalization has promoted the exchange and integration of different cultures, but it has also brought about multicultural conflicts, which have a profound impact on campus culture construction. Multicultural conflicts are mainly manifested in the collision between different values, lifestyles, and cultural traditions, which may lead to confusion in students' values, weakening of cultural identity, and even social instability.

To cope with the impact of multicultural conflicts, universities should take the following measures: first, strengthen cultural confidence education. By carrying out education on excellent traditional culture, revolutionary culture, and advanced socialist culture, we can enhance students' sense of identity and pride in Chinese culture, and improve their ability to distinguish and resist harmful cultural influences. Secondly, promote multicultural dialogue and communication. Universities should create an inclusive campus cultural environment, encourage students to learn and understand different cultures, and carry out multicultural exchange activities, such as international cultural festivals and cultural forums, to promote mutual understanding and respect between different cultures. Finally, establish a correct cultural outlook. Guide students to treat different cultures with a scientific attitude, absorb the essence of other cultures, and discard the dross, so as to realize the innovation and development of campus culture on the basis of inheriting excellent traditional culture.

4.2 Challenges and Opportunities of New Media and Other Technologies to Cultural Inheritance in the Information Age

The development of information technology, especially the popularization of new media, has brought new challenges and opportunities to cultural inheritance. On the one hand, new media has changed the way of cultural communication and dissemination, making cultural resources more abundant and accessible, which is conducive to the inheritance and promotion of campus culture. On the other hand, new media also has some negative impacts, such as the spread of false information, the erosion of vulgar culture, and the weakening of interpersonal communication, which have a negative impact on cultural inheritance.

To cope with the challenges and seize the opportunities brought by new media, universities should take the following measures: first, strengthen the construction of campus new media platforms. Build a unified and standardized campus new media platform, integrate campus news, cultural activities, and educational resources, and improve the timeliness and effectiveness of cultural dissemination. Secondly, strengthen the management and guidance of new media. Establish a sound management system for new media, strengthen the supervision of information content, and prevent the spread of false information and vulgar culture. At the same time, guide students to use new media correctly, improve their information literacy and media literacy. Finally, promote the integration of new media and traditional cultural inheritance methods. Combine new media technologies with traditional cultural activities, such as online exhibitions, virtual museums, and digital libraries, to innovate the form and carrier of cultural inheritance and enhance the attractiveness and influence of traditional culture.

4.3 Strategies for Enhancing the Use of External Environmental Resources and the Guiding Role of the Government

The construction of campus culture cannot be separated from the support of external environmental resources, and the government's guidance and support play an important role in campus culture construction. Therefore, universities should actively use external environmental resources and strengthen the cooperation with the government to promote the healthy development of campus culture construction.

First of all, universities should strengthen the integration and utilization of social resources. Establish cooperative relations with enterprises, institutions, communities, and other social organizations, and attract social capital, talents, and technology to participate in campus culture construction. For example, enterprises can provide sponsorship for campus cultural activities, and communities can provide venues and resources for campus cultural activities, so as to enrich the content and form of campus culture. Secondly, the government should strengthen its guiding role in campus culture construction. The government should formulate relevant policies and regulations to guide and standardize the development of campus culture construction. At the same time, increase financial investment in campus culture construction, support universities to carry out cultural research, cultural activities, and cultural infrastructure construction. Finally, establish a coordination mechanism between universities and the government. Strengthen communication and cooperation between universities and the government, form a joint force, and promote the healthy and sustainable development of campus culture construction.

5. Conclusion

Contemporary university campus culture construction is a complex system project, which involves many aspects such as theory, practice, and environment. In the context of globalization and informatization, campus culture construction is facing new challenges and opportunities. This study clarifies the connotation, characteristics, and functional structure of university campus culture, constructs the core value system of campus culture, and explores the practical path of campus culture construction through theoretical analysis and practical research.

The research shows that the construction of contemporary university campus culture should take socialist core values as the guidance, adhere to the people-oriented concept, and realize the organic integration of theory and practice. In terms of content, we should promote innovation and diversified development, integrate traditional culture and modern culture, professional culture and general culture. In terms of mechanism, we should establish and improve the student participation mechanism, optimize the interaction between the campus environment and students, and give full play to the main role of students. In the face of challenges, we should take active coping strategies, strengthen cultural confidence education, promote multicultural dialogue and communication, strengthen the construction and management of new media, and strengthen the integration and utilization of external resources and the guiding role of the government.

In the future, with the continuous development of society and the progress of science and technology, university campus culture construction will face more new situations and new problems. Therefore, we need to continuously deepen theoretical research, sum up practical experience, and explore new ideas and new methods of campus culture construction to provide a strong cultural support for the development of higher education and the cultivation of high-quality talents.

References

[1] Smith, C. (2024, March 18). Inclusive by design: A university building redefining belonging. CannonDesign. Retrieved from https://www.cannondesign.com/perspectives/inclusive-by-design-university-building-redefining-belonging

[2] University of Central Florida. (2019, October 6). Community & Culture. Retrieved from [https://www.ucf.edu/unleashing-potential/community-

culture/](https://www.ucf.edu/unleashing-potential/community-culture/)
[3] Stevens Institute of Technology. (2019, October 6). Stevens to Begin a Game-Changing Building Project That Will Redefine Campus Culture at Castle Point. Retrieved from https://www.stevens.edu/news/stevens-begin-game-changing-building-project-will-redefine-campus-culture-castle-point
[4] Hu, Z. (2020, April 16). Thought-sharing | Hu Zhonghua: The construction of campus culture in socialist advanced culture development. The Paper. Retrieved from https://m.thepaper.cn/newsDetail_forward_7001458
[5] Shen, S. (2020, February 10). Learning during the pandemicShen Shuhong | Analyzing the content dimensions of contemporary Chinese school culture research. Private Education. Retrieved from http://m.toutiao.com/group/6791634197808153092/?upstream_biz=doubao
[6] Du, S., & Sun, Y. (2016, October 9). Pitfalls and transcending approaches in the construction of campus culture in primary and secondary schools. Research Institute of Moral Education, Central China Normal University. Retrieved from https://ime.ccnu.edu.cn/info/1023/1087.htm
[7] Publicity Department of the CPC Central Committee. (2024). Xi Jinping's Cultural Thought Study Outline [M]. Learning Press & People's Publishing House.

Integration and Development of Excellent Traditional Chinese Culture and Socialist Core Values

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Abstract: This study explores the integration and development pathways of excellent traditional Chinese culture and socialist core values, uncovering their intrinsic logical connections and mutual promotion mechanisms to provide theoretical support for cultural construction in the new era. Using literature review, logical analysis, and comparative research methods, the study systematically examines the core essence of traditional Chinese culture and the theoretical connotations of socialist core values, constructing an analytical framework for their integration. Based on Marxist cultural perspectives and contemporary Chinese social realities, the research identifies value convergence points and transformation mechanisms during the integration process. From the dual perspectives of historical inheritance and innovation for the times, practical pathways for integration and development are discussed. Findings indicate that traditional Chinese culture provides a profound cultural foundation for socialist core values, while these values endow traditional culture with new contemporary meanings. the two share inherent consistency in their value pursuits. Through conceptual transformation, educational penetration, and practical innovation, their organic integration can be realized, thereby enhancing cultural identity and value consensus.

Keywords: Excellent Traditional Chinese Culture; Socialist Core Values; Integration Development; Cultural Identity; Value Convergence

1. Introduction

1.1 Research Background and Significance

In the context of global cultural diversity and the deepening of domestic social transformation, the construction of cultural identity and value consensus has become a key task in promoting national development and national rejuvenation. Excellent traditional Chinese culture, as a spiritual treasure accumulated over thousands of years of historical development, contains rich ideological connotations and value concepts, which provide a profound cultural foundation for the formation and development of contemporary social values. Socialist core values, as the concentrated embodiment of the spiritual pursuit of contemporary Chinese society, inherit the essence of traditional culture while responding to the needs of the times and social development.

Against the backdrop of accelerating cultural globalization, how to realize the organic integration of excellent traditional Chinese culture and socialist core values is not only related to the inheritance and innovation of national culture but also related to the consolidation of the ideological foundation of national cohesion and centripetal force. This integration is conducive to enhancing the cultural confidence of the whole nation, promoting the modern transformation of traditional culture, and enabling socialist core values to take root in the fertile soil of traditional culture, thus showing stronger vitality and appeal. At the same time, in the process of promoting social governance and national construction, the integrated development of the two can provide a more solid value support for solving social contradictions and promoting social harmony, and lay a solid cultural foundation for realizing the great rejuvenation of the Chinese nation.

1.2 Review of Domestic and Foreign Research Status

Domestic research on the relationship between excellent traditional Chinese culture and socialist core values has gradually deepened in recent years. Scholars have explored the theoretical connotation, value connection, and practical path of the two from multiple perspectives. Some studies focus on excavating the cultural genes in traditional culture that are compatible with socialist core values, emphasizing that traditional culture provides a historical source for the formation of core values. Others discuss the ways and methods of integrating traditional culture into the education of core values, and put forward specific strategies in the fields of school education, social propaganda, and cultural practice. However, there are still some deficiencies in existing studies: the research on the integration mechanism is not systematic enough, and the discussion on the dynamic balance between inheritance and innovation in the integration process is relatively lacking.

Foreign research on Chinese culture and values mainly focuses on the comparative study of Eastern and Western cultures and the international influence of Chinese culture. Some foreign scholars pay attention to the modern transformation of traditional Chinese culture and its impact on social development, but due to differences in cultural backgrounds and research perspectives, there is a lack of in-depth understanding of the internal logic of the integration of excellent traditional Chinese culture and socialist core values. Most foreign studies stay at the level of phenomenon description, and there is a lack of theoretical construction and practical exploration on the integration path.

1.3 Research Ideas and Methods

This study takes the integrated development of excellent traditional Chinese culture and socialist core values as the research object, and follows the research idea of "theoretical connotation analysis-internal relationship exploration-integration mechanism construction-practice path promotion". First, it combs the core essence of excellent traditional Chinese culture and the theoretical connotation of socialist core values, laying a theoretical foundation for exploring their integration. Then, it deeply analyzes the internal connection between the two, focusing on the consistency of value pursuit, the continuity of cultural inheritance, and the mutual promotion of era development. On this basis, it constructs the integration mechanism from the aspects of concept transformation, education infiltration, and practice innovation, and finally puts forward specific paths for integrated development.

In terms of research methods, this study mainly adopts the following methods: literature research method, by sorting out and analyzing relevant domestic and foreign literature, sorting out the research context and theoretical basis of the integration of excellent traditional Chinese culture and socialist core values; logical analysis method, using logical reasoning to clarify the internal logical relationship between the two, and constructing a theoretical framework for their integration; comparative research method, comparing the value concepts in excellent traditional Chinese culture with socialist core values, exploring their similarities and differences, and providing a basis for promoting integration.

2. Theoretical Connotations of Excellent Traditional Chinese Culture and Socialist Core Values

2.1 Core Essence of Excellent Traditional Chinese Culture

Excellent traditional Chinese culture is a complex system of ideas and culture formed in the long-term historical development of the Chinese nation, which contains rich connotations and spiritual essence. It emphasizes the unity of man and nature, advocating that human beings should live in harmony with nature and maintain ecological balance, which is reflected in the concepts of "the unity of heaven and man" and "following the way of nature". In terms of ethical morality, it pays attention to benevolence, righteousness, propriety, wisdom, and faith, takes "benevolence" as the core, advocates loving others, respecting elders and caring for the young, and emphasizes the cultivation of personal morality and moral responsibility.

In social governance, it advocates the idea of "governing with virtue", emphasizing that rulers should govern the country with morality and virtue, and realize social harmony and stability. At the same time, it attaches importance to the family as the basic unit of society, advocates the ethics of family

harmony, and regards family education and family traditions as important ways to maintain social order. In addition, excellent traditional Chinese culture also includes the spirit of perseverance, the pursuit of truth, and the consciousness of patriotism, which have been inherited and carried forward in the historical process and have become an important part of the national spirit.

2.2 Theoretical Connotation of Socialist Core Values

Socialist core values, with three levels of national, social, and individual, put forward clear value requirements. At the national level, it advocates "prosperity, democracy, civilization, and harmony", which reflects the goal of national development and the pursuit of national rejuvenation. Prosperity refers to the realization of material wealth and economic strength, providing a solid material foundation for national development; democracy emphasizes the people's status as masters of the country and the development of socialist democratic politics; civilization includes material civilization, political civilization, spiritual civilization, social civilization, and ecological civilization, reflecting the all-round progress of society; harmony refers to the harmony between people, between people and society, and between people and nature.

At the social level, it advocates "freedom, equality, justice, and the rule of law", which is the value pursuit of social development and the guarantee of social order. Freedom is the freedom of citizens within the scope permitted by law, including political freedom, economic freedom, and cultural freedom; equality emphasizes that all citizens are equal before the law and enjoy equal rights and opportunities; justice requires fair distribution of social resources and fair treatment of all members of society; the rule of law advocates governing the country according to law and safeguarding social order and citizens' rights with the rule of law.

At the individual level, it advocates "patriotism, dedication, integrity, and friendliness", which is the basic code of conduct for citizens. Patriotism requires citizens to love the motherland and safeguard national interests; dedication emphasizes that individuals should fulfill their duties and contribute to society in their own posts; integrity requires abide by promises and be honest and trustworthy in social interactions; friendliness advocates that people should treat each other with kindness and help each other.

3. Internal Relationship between Excellent Traditional Chinese Culture and Socialist Core Values

3.1 Consistency of Value Pursuit

Excellent traditional Chinese culture and socialist core values have consistency in value pursuit, both aiming at realizing social harmony, national prosperity, and people's happiness. In excellent traditional Chinese culture, the pursuit of "great harmony" reflects the ideal of a harmonious society, which is consistent with the "harmony" at the national level in socialist core values. the concept of "people-oriented" in traditional culture, which emphasizes the importance of the people, is similar to the value orientation of socialist core values that take the people as the center.

The emphasis on moral cultivation in traditional culture, such as "self-cultivation, family harmony, state governance, and world peace", is consistent with the requirements of "patriotism, dedication, integrity, and friendliness" at the individual level of socialist core values. Both advocate that individuals should improve their own quality and contribute to society and the country. In addition, the pursuit of justice and fairness in traditional culture, such as "the way of heaven is to make up for the deficiency", is in line with the "justice" in socialist core values, reflecting the common pursuit of a fair and just social order.

3.2 Continuity of Cultural Inheritance

Socialist core values are not created out of thin air but are formed on the basis of inheriting excellent traditional Chinese culture, showing the continuity of cultural inheritance. Many concepts in socialist core values can find their historical sources in traditional culture. For example, the "patriotism" in individual-level values is inherited from the patriotic spirit in traditional culture, such as "devoting oneself to the country" and "serving the country with loyalty". the "civilization" at the national level absorbs the essence of traditional cultural concepts such as "propriety" and "politeness". The "harmony" in socialist core values is also deeply rooted in the traditional concept of "the

unity of heaven and man" and "harmony without uniformity". This continuity of cultural inheritance makes socialist core values have a profound cultural foundation and national identity, and enables the people to better understand and accept them in the process of cultural inheritance. At the same time, the inheritance of culture is not a simple copy but a critical inheritance and innovative development, which makes socialist core values both have the characteristics of traditional culture and adapt to the needs of the times.

3.3 Mutual Promotion of Era Development

Excellent traditional Chinese culture and socialist core values promote each other in the development of the times, forming a positive interaction mechanism. On the one hand, excellent traditional Chinese culture provides a source of thought and cultural support for the development and improvement of socialist core values. With the development of the times, socialist core values need to continuously absorb the essence of traditional culture to enrich their connotation and enhance their cultural appeal. For example, in the context of ecological civilization construction, the traditional concept of "the unity of heaven and man" provides important enlightenment for the "harmony" in socialist core values, promoting the continuous improvement of ecological value concepts.

On the other hand, socialist core values provide a guide for the modern transformation of excellent traditional Chinese culture, enabling traditional culture to play a role in contemporary society. Under the guidance of socialist core values, traditional culture can get rid of the dross that is not suitable for the development of the times and realize the creative transformation and innovative development. For example, the traditional concept of "governing with virtue" has been innovated and developed in the context of socialist core values, forming a governance model combining the rule of law and the rule of virtue, which promotes the modernization of national governance.

4. Integration Mechanism of Excellent Traditional Chinese Culture and Socialist Core Values

4.1 Concept Transformation Mechanism

The concept transformation mechanism is the key to realizing the integration of excellent traditional Chinese culture and socialist core values, which mainly involves transforming the traditional cultural concepts into modern value concepts compatible with socialist core values. This transformation is not a one-sided adaptation but a mutual integration and absorption. First, it is necessary to excavate and sort out the traditional cultural concepts that have contemporary value, and interpret them from the perspective of the times. For example, the traditional concept of "benevolence" can be transformed into the concept of "loving others" and "caring for society" in modern society, which is compatible with the "friendliness" in socialist core values.

Second, it is necessary to find the combination points between traditional cultural concepts and socialist core values, and realize the connection between the two. For example, the traditional concept of "justice" can be connected with the "justice" in socialist core values, and through theoretical interpretation, make the traditional concept of justice have the connotation of the times. Finally, it is necessary to promote the modern expression of traditional cultural concepts, using modern language and ways of thinking to express traditional cultural concepts, so that they can be better understood and accepted by contemporary people, and then integrated into socialist core values.

4.2 Education Infiltration Mechanism

The education infiltration mechanism is an important way to promote the integration of excellent traditional Chinese culture and socialist core values, which mainly infiltrates traditional cultural elements into the education of socialist core values through various educational channels. In school education, it is possible to integrate excellent traditional culture into the curriculum system, set up relevant courses such as traditional culture and ethics, and infiltrate the concepts of socialist core values in the teaching process. For example, in Chinese language and literature courses, through the interpretation of classic works, students can understand the traditional virtues such as benevolence, righteousness, propriety, wisdom, and faith, and then connect with the "patriotism, dedication, integrity, and friendliness" in socialist core values.

In social education, it is possible to carry out various cultural activities, such as traditional festival celebrations, cultural lectures, and exhibition of cultural relics, to let the public feel the charm of traditional culture in practice and understand the connection between traditional culture and socialist core values. In family education, it is possible to inherit good family traditions and family virtues, and imperceptibly influence family members' recognition of socialist core values through the edification of traditional culture. the education infiltration mechanism should pay attention to the combination of explicit education and implicit education, so that the integration of the two can be carried out in a subtle way.

4.3 Practice Innovation Mechanism

The practice innovation mechanism is the bridge to realize the integration of excellent traditional Chinese culture and socialist core values, which promotes the integration of the two in specific social practices through innovative forms and carriers. In cultural practice, we can carry out creative transformation of traditional cultural forms, such as adapting traditional operas, folk stories, and paintings into works that reflect socialist core values, so that the public can understand and accept core values in the process of appreciating traditional culture. For example, creating modern operas with the theme of "integrity" and "dedication" based on traditional opera forms, which not only inherit traditional culture but also spread socialist core values.

In social practice, we can carry out volunteer service activities, public welfare activities, etc., which integrate the concepts of traditional culture and socialist core values. For example, carrying out activities to help the elderly and the disabled, which embodies the traditional virtue of "loving others" and the "friendliness" in socialist core values. In addition, with the help of modern science and technology, we can innovate the practice carrier, such as using the Internet, mobile apps, etc., to carry out online cultural activities and value publicity, expanding the scope and influence of integration practice. the practice innovation mechanism should pay attention to the combination of tradition and modernity, so that the integration of the two can keep pace with the times.

5. Paths for the Integrated Development of Excellent Traditional Chinese Culture and Socialist Core Values

5.1 Constructing a Cultural Inheritance and Innovation System

Constructing a cultural inheritance and innovation system is the foundation for promoting the integrated development of excellent traditional Chinese culture and socialist core values. First, it is necessary to strengthen the protection and sorting out of excellent traditional culture, establish a sound database of traditional cultural resources, and systematically sort out and research traditional cultural classics, folk customs, and intangible cultural heritage. On this basis, we should carry out in-depth research on the value connotation of traditional culture, excavate the essence of culture that is compatible with socialist core values, and provide a resource guarantee for integration.

Second, we should promote the creative transformation and innovative development of traditional culture. Inheriting traditional culture is not to copy it mechanically but to innovate on the basis of inheritance, so that traditional culture can adapt to the needs of modern society. For example, integrating traditional cultural elements into modern design, fashion, and architecture to make traditional culture show new vitality. Finally, we should build a platform for cultural exchange and dissemination, promote the exchange and integration of traditional culture and modern culture, and create a cultural atmosphere conducive to the integration of excellent traditional Chinese culture and socialist core values.

5.2 Improving the Practical Path of Value Guidance

Improving the practical path of value guidance is an important link to promote the integrated development of the two. It is necessary to give full play to the role of various social organizations and institutions in value guidance, and form a joint force of value guidance. Government departments should strengthen the guidance and planning of value construction, incorporate the integration of excellent traditional Chinese culture and socialist core values into the national cultural development strategy, and formulate relevant

policies and measures to promote integration. Cultural institutions such as museums, libraries, and cultural centers should give full play to their educational functions, hold various exhibitions and activities, and publicize the connection between traditional culture and socialist core values. Media should play a role in public opinion guidance, spread positive energy through news reports, documentaries, and public service advertisements, and promote the integration of the two in the whole society. In addition, it is necessary to carry out value guidance in combination with social hot issues, so that the public can understand the practical significance of integration in solving social problems.

5.3 Improving the Guarantee Mechanism for Integrated Development

Improving the guarantee mechanism for integrated development is the guarantee to promote the smooth progress of integration. In terms of system guarantee, it is necessary to establish and improve relevant laws, regulations, and policies to provide institutional support for the integration of excellent traditional Chinese culture and socialist core values. For example, formulating policies to support the inheritance and innovation of traditional culture, and encouraging social forces to participate in the integration practice.

In terms of talent guarantee, it is necessary to strengthen the training of professionals, cultivate a group of talents who are proficient in both excellent traditional Chinese culture and socialist core values, and provide intellectual support for integration. We can set up relevant majors in colleges and universities, carry out in-depth research and teaching, and train compound talents. In terms of financial guarantee, it is necessary to increase financial investment, set up special funds for the integration of excellent traditional Chinese culture and socialist core values, support relevant research, practice activities, and cultural projects, and ensure the smooth implementation of integration work.

6. Conclusion

The integrated development of excellent traditional Chinese culture and socialist core values is an important task in the construction of contemporary Chinese culture, which has important theoretical and practical significance. Through the analysis of the theoretical connotation, internal relationship, integration mechanism, and development path of the two, it can be seen that excellent traditional Chinese culture and socialist core values have a solid foundation for integration, and there is a broad space for integration.

The consistency of value pursuit provides a logical premise for integration, the continuity of cultural inheritance provides a historical basis, and the mutual promotion of era development provides a dynamic power. By constructing a sound integration mechanism and promoting it through practical paths such as cultural inheritance and innovation, value guidance, and guarantee mechanism improvement, the organic integration of the two can be realized.

This integration is not only conducive to enhancing cultural confidence and national identity but also conducive to providing a solid value support for national development and social progress. In the future, we need to continue to deepen theoretical research and practical exploration, constantly sum up experience, and promote the integrated development of excellent traditional Chinese culture and socialist core values to a deeper level, so

References

[1] Xi Jinping. Holding High the Great Banner of Socialism with Chinese Characteristics and Striving in Unity to Build a Modern Socialist Country in All Respects: Report to the 20th National Congress of the Communist Party of China [M]. Beijing: People's Publishing House, 2022.

[2] Xi Jinping. On the Party's Propaganda and Ideology Work [M]. Beijing: Central Literature Publishing House, 2020.

[3] CPC Central Committee. Resolution on the Major Achievements and Historical Experience of the Party's Centennial Struggle [M]. Beijing: People's Publishing House, 2021.

[4] CPC Central Committee. Decision on Further Deepening Reform and Promoting Chinese-Style Modernization [M]. Beijing: People's Publishing House, 2024.

[5] Chen, B. On the Deep Integration of Excellent Traditional Chinese Culture and Socialist Core Values [J]. Ideological

Education Research, 2019(11), 10-14.
[6] Guo, M. the Logical Path and Practical Approach of Integrating Excellent Traditional Chinese Culture into Socialist Core Values [J]. Teaching and Research, 2020(02), 5-13.
[7] Wang, Y. the Logic and Practice of Aligning Excellent Traditional Chinese Culture with Socialist Core Values [J]. China Higher Education, 2021(Z3), 20-22.
[8] Tang, X., & Wei, S. the Triple Logic of Integrating Excellent Traditional Chinese Culture into the Cultivation of Socialist Core Values [J]. Journal of Ideological and Theoretical Education, 2022(06), 106-111.
[9] Zhu, X., & Liu, H. the Internal Logic and Practical Path of the Integration of Excellent Traditional Chinese Culture and Socialist Core Values [J]. Journal of Henan Normal University (Philosophy and Social Sciences Edition), 2023(02), 14-19.
[10] Liu, H., & Zhu, X. the Value Implications, Internal Logic, and Practical Path of the Fusion of Excellent Traditional Chinese Culture and Socialist Core Values [J]. Research on Ideological and Political Education, 2024(01), 134-139.

Innovative Practices in Preschool Handicraft Courses from the Perspective of Entrepreneurship and Innovation Education

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Abstract: This study explores innovative practices in preschool handicraft courses through the lens of entrepreneurship and innovation education, addressing the lack of innovation awareness and disconnection from the principles of entrepreneurship and innovation in current preschool curricula. the research aims to provide theoretical and practical guidance to enhance children's creative thinking and practical abilities. Using literature review, action research, and questionnaire surveys, the study first analyzes relevant domestic and international research on entrepreneurship and innovation education and preschool handicraft courses to establish its theoretical foundation and understand the current situation. Based on the principles of entrepreneurship and innovation education, an innovative practice framework for preschool handicraft courses is developed, encompassing curriculum goal reconstruction, content optimization, teaching method innovation, and evaluation system enhancement. the framework was applied in a semester-long practical study in three preschools. Data were collected through classroom observations, teacher interviews, and analysis of children's work, and were statistically analyzed using SPSS, supplemented by qualitative data analysis. Results show that integrating entrepreneurship and innovation principles into the curriculum significantly enhances children's creative thinking, hands-on skills, and collaborative abilities. This provides an actionable model for reforming preschool handicraft courses, with the core innovation lying in adapting the "innovation" and "entrepreneurship" spirit of entrepreneurship and innovation education into elements suitable for early childhood development.

Keywords: Entrepreneurship and innovation education; Preschool education; Handicraft courses; Curriculum innovation; Practice research

1. Introduction

1.1 Research Background and Significance

In the context of global economic transformation and educational reform, the cultivation of innovative and entrepreneurial talents has become a core goal of educational development in various countries. Preschool education, as the foundation of the entire educational system, bears the important mission of nurturing initial innovative awareness and practical abilities in young children. Handcraft courses, as a key component of preschool education, have long been valued for their role in developing fine motor skills and aesthetic perception. However, with the deepening of educational practice, traditional handcraft teaching models gradually reveal limitations: excessive emphasis on skill imitation, neglect of the cultivation of children's independent thinking and creative expression, and a lack of effective integration with the concepts of innovation and entrepreneurship education.

Against this backdrop, the integration of double innovation education concepts into preschool handcraft courses has become an inevitable trend in educational reform. Double innovation education, which emphasizes the organic combination of innovative consciousness and entrepreneurial spirit, provides a new theoretical perspective and practical path for breaking through the bottlenecks of traditional handcraft teaching. In current preschool education practice, there is an urgent need for a curriculum system that can simultaneously develop children's hands-

on skills and innovative thinking. Such a system not only responds to the call of national educational policies for quality-oriented education but also meets the needs of social development for talents with innovative potential.

The practical significance of this research lies in three aspects: first, it explores the specific path of integrating double innovation education into preschool handcraft courses, providing actionable reform plans for front-line preschool teachers; second, it constructs an innovative practice framework for handcraft courses, enriching the theoretical system of preschool education curriculum innovation; third, it promotes the all-round development of young children's innovative thinking, practical ability, and cooperative spirit, laying a solid foundation for their lifelong learning and development.

1.2 Review of Domestic and Foreign Research Status

Foreign research on innovation and entrepreneurship education in preschool education started earlier and has formed a relatively mature theoretical system and practical model. Scholars in Europe and America focus on the cultivation of children's initiative and exploratory spirit, advocating that handcraft activities should be based on children's life experiences and encourage open-ended creation. For example, some educational institutions in Finland integrate handcraft creation with environmental protection projects, guiding children to use waste materials for creative production, which not only cultivates hands-on ability but also implants the concept of sustainable development. In the United States, project-based learning in preschool education is widely used in handcraft courses, emphasizing that children explore problems and complete works through collaborative inquiry, which has a positive effect on cultivating innovative thinking.

Domestic research on double innovation education in preschool education has gradually increased in recent years, but most of them focus on the theoretical discussion of the connotation and significance of double innovation education, and there is a lack of in-depth research on the specific integration path with handcraft courses. Some studies have pointed out that traditional preschool handcraft courses have problems such as a single form and rigid evaluation, and proposed the necessity of introducing innovative elements, but there is a lack of empirical support in practice. In terms of curriculum design, existing research pays more attention to the update of handcraft content and less to the systematic construction of curriculum goals, teaching methods, and evaluation systems from the perspective of double innovation education.

In summary, both domestic and foreign research have laid a certain theoretical foundation for this study, but there is still a research gap in the integration of double innovation education and preschool handcraft courses, especially in the construction of an innovative practice framework and empirical research on application effects, which needs further exploration.

1.3 Research Ideas and Methods

This study takes the integration of double innovation education and preschool handcraft courses as the core, and adopts a research path combining theoretical construction and empirical verification. First, through literature analysis, the theoretical connotation of double innovation education and the current situation of preschool handcraft courses are sorted out, and the theoretical basis for the integration of the two is clarified. On this basis, an innovative practice framework for preschool handcraft courses from the perspective of double innovation education is constructed, including four dimensions: curriculum goal reconstruction, content optimization, teaching method innovation, and evaluation system improvement.

In terms of research methods, this study comprehensively uses multiple research methods to ensure the and validity of the research results. the literature research method is used to collect and sort out domestic and foreign literature on double innovation education, preschool education, and handcraft courses, so as to clarify the research status and theoretical support. the action research method is adopted to carry out practice in selected kindergartens, continuously adjust and optimize the curriculum plan in the process of "plan-implement-evaluate-reflect", and improve the feasibility of the practice

framework. the questionnaire survey method is used to collect the opinions and suggestions of preschool teachers on the innovative practice of handcraft courses, and to understand the changes in children's abilities before and after the practice. In addition, classroom observation and child work analysis are used to conduct qualitative analysis of the practice process and results, so as to comprehensively evaluate the effect of the innovative practice framework.

2. Theoretical Relationship between Double Innovation Education and Preschool Education Handcraft Courses

2.1 Core Connotation and Value Orientation of Double Innovation Education

Double innovation education is not a simple combination of innovation education and entrepreneurship education, but a educational concept that integrates innovative consciousness, entrepreneurial spirit, and practical ability. Its core connotation includes three levels: at the cognitive level, it emphasizes the cultivation of critical thinking and problem-solving ability; at the behavioral level, it advocates the spirit of exploration and hands-on practice; at the emotional level, it focuses on the shaping of teamwork awareness and risk-taking spirit. Unlike traditional education that focuses on knowledge inheritance, double innovation education pays more attention to stimulating individual potential and cultivating comprehensive quality that adapts to social changes.

The value orientation of double innovation education is reflected in two aspects: on the one hand, it meets the needs of social development for innovative talents. In the era of knowledge economy, innovation has become the core driving force for economic and social development, and the cultivation of innovative ability should start from an early age. On the other hand, it conforms to the law of children's physical and mental development. Preschool children are in a critical period of cognitive development and have a strong desire for exploration and curiosity. Double innovation education can provide a suitable educational environment for them to give full play to their imagination and creativity.

2.2 Development Status and Innovation Needs of Preschool Education Handcraft Courses

Preschool education handcraft courses have a long history of development, and their forms and contents have been continuously enriched with the progress of education. At present, handcraft courses in most kindergartens mainly include paper-cutting, origami, clay modeling, and manual sewing, which are intended to exercise children's fine motor skills and aesthetic ability. However, in terms of specific implementation, there are still some problems: in terms of curriculum goals, they are overly focused on the mastery of skills, and lack attention to the cultivation of innovative thinking; in terms of teaching content, they are often limited to fixed templates and materials, which restrict children's creative space; in terms of teaching methods, teachers dominate the demonstration, and children passively imitate, which is not conducive to the development of independent thinking ability; in terms of evaluation, they pay attention to the completion of works, and ignore the process of children's exploration and experience.

With the advancement of quality-oriented education, preschool handcraft courses are facing an urgent need for innovation. First, the goal of the curriculum needs to be expanded from skill training to the cultivation of comprehensive quality, including innovative consciousness, practical ability, and cooperative spirit. Second, the content of the curriculum needs to be connected with children's life experience, introduce diversified materials and themes, and stimulate children's interest and motivation in creation. Third, teaching methods need to be transformed from teacher-centered to child-centered, encouraging children to explore independently and express themselves freely. Finally, the evaluation system needs to pay more attention to the process of children's participation and the development of abilities, rather than just the results of works.

2.3 Feasibility Analysis of Integrating Double Innovation Education into Preschool Handcraft Courses

The integration of double innovation education into preschool handcraft courses has sufficient theoretical and practical feasibility. From the perspective of theoretical basis, the

concept of double innovation education is consistent with the educational philosophy of preschool education. Preschool education advocates respecting children's personality development and promoting all-round development, which is highly consistent with the value orientation of double innovation education in cultivating innovative spirit and practical ability. At the same time, the theory of constructivism emphasizes that learning is a process in which learners actively construct knowledge, which provides theoretical support for the integration of double innovation education into handcraft courses, that is, guiding children to construct their own knowledge and experience in the process of handcraft creation.

From the perspective of practical conditions, handcraft courses themselves have the natural advantage of carrying double innovation education. Handcraft creation is a process that combines hands and brains, which can effectively cultivate children's innovative thinking and practical ability. In the process of selecting materials, designing schemes, and solving problems, children can experience the charm of innovation and the joy of creation. In addition, kindergartens have a relatively mature handcraft teaching system and material conditions, which can provide a good foundation for the integration of double innovation education.

From the perspective of children's development, preschool children are in a period of rapid development of imagination and creativity, and have a strong desire to explore the world around them. Double innovation education integrated into handcraft courses can meet their psychological needs, stimulate their internal motivation for learning, and promote the development of various abilities. For example, in the process of using waste materials to create handcrafts, children can not only exercise their hands-on ability but also develop the awareness of environmental protection and innovative thinking.

3. Construction of an Innovative Practice Framework for Preschool Handcraft Courses from the Perspective of Double Innovation Education

3.1 Reconstruction of Curriculum Goals: Based on the Cultivation of Double Innovation Literacy

The reconstruction of curriculum goals is the first step in the innovation of preschool handcraft courses from the perspective of double innovation education, which needs to be based on the cultivation of double innovation literacy and integrate the development of children's innovative consciousness, entrepreneurial spirit, and practical ability. Specifically, the curriculum goals include three levels: cognitive goals, skill goals, and emotional goals.

Cognitive goals focus on helping children understand the relationship between handcraft creation and life, master the basic properties and usage methods of various materials, and develop the ability to observe, think, and solve problems in the process of creation. For example, guiding children to discover the characteristics of different materials in life and think about how to use these materials for creative production.

Skill goals emphasize the cultivation of children's basic handcraft operation skills and innovative application abilities. On the basis of mastering simple cutting, pasting, and kneading skills, children are encouraged to try to combine different materials and techniques to create works with personal characteristics. At the same time, they cultivate the ability to use tools safely and cooperate with others in the process of creation.

Emotional goals aim to stimulate children's interest and enthusiasm for handcraft creation, cultivate their sense of innovation and exploration, and enhance their self-confidence and sense of cooperation. Through successful creation experience, children can experience the joy of innovation and establish a positive attitude towards learning and life.

3.2 Optimization of Curriculum Content: Integrating Life and Innovation Elements

The optimization of curriculum content should adhere to the principle of integrating life and innovation elements, closely connect with children's life experience, and select themes and materials that are close to life, interesting, and exploratory to stimulate children's creative motivation.

In terms of theme selection, it should be based on children's interests and life scenes, such as "My Family", "Community Environment", "Seasons Change", etc. These themes are familiar to children, which can arouse their

resonance and creative desire. At the same time, appropriate innovative elements are added to the themes, such as guiding children to imagine the future family or design a community facility, so as to expand their thinking space.

In terms of material selection, we should break through the limitation of traditional handcraft materials and introduce diversified and recyclable materials, such as waste paper, plastic bottles, fabric scraps, natural materials (stones, leaves, branches, etc.). the use of these materials not only reduces the cost of the curriculum but also cultivates children's awareness of environmental protection and innovative thinking. For example, guiding children to use plastic bottles to make toys or flower pots, which can not only exercise their hands-on ability but also let them understand the value of waste reuse.

In terms of content organization, a modular curriculum system can be adopted, including basic handcraft module, creative design module, and cooperative practice module. the basic handcraft module focuses on the learning of basic skills; the creative design module emphasizes the cultivation of innovative thinking, guiding children to carry out open creation; the cooperative practice module focuses on the development of teamwork ability, through group cooperation to complete more complex handcraft projects.

3.3 Innovation of Teaching Methods: Adopting Inquiry and Project-Based Teaching

The innovation of teaching methods is the key to realizing the integration of double innovation education and preschool handcraft courses. Inquiry-based teaching and project-based teaching are important methods to stimulate children's innovative thinking and practical ability, and are suitable for application in preschool handcraft courses.

Inquiry-based teaching takes problem as the starting point, guides children to explore and solve problems independently in the process of handcraft creation. Teachers can set up situational problems according to the curriculum content, such as "How to make a toy car that can move?" "How to use leaves to make a beautiful picture?" Let children think, discuss, and try to solve problems through practice. In this process, teachers play the role of guide and helper, providing necessary support and guidance for children, rather than directly giving answers.

Project-based teaching takes a specific project as the carrier, and guides children to complete the whole process of the project from planning to implementation through group cooperation. For example, taking "Building a Small Garden" as a project, children need to discuss the design of the garden, select materials, divide labor and cooperate, and finally complete the production of the garden model. In the process of completing the project, children can not only exercise their hands-on ability and innovative thinking but also develop their teamwork ability and sense of responsibility.

In the specific application of teaching methods, attention should be paid to the combination of collective teaching, group activities, and individual exploration. Collective teaching is used to explain the basic knowledge and skills; group activities are used to carry out cooperative creation and discussion; individual exploration is used to give full play to children's personality and creativity. At the same time, modern educational technology can be used to assist teaching, such as showing children's handcraft works through multimedia, or using video to display the production process of complex works, so as to expand children's vision and stimulate their creative inspiration.

3.4 Improvement of Curriculum Evaluation System: Focusing on Process and Developmental Evaluation

The improvement of the curriculum evaluation system should break through the traditional evaluation model that focuses on the results of works, and establish a process-oriented and developmental evaluation system that pays attention to children's participation process, ability development, and emotional experience.

In terms of evaluation content, it should include not only the completion of handcraft works but also the performance of children in the creation process, such as the enthusiasm of participation, the ability to think independently, the ability to solve problems, and the ability to cooperate with others. At the same time, attention should be paid to the development and progress of children's

innovative thinking and practical ability, such as whether they can put forward new ideas, try new methods, and improve their works according to suggestions.

In terms of evaluation methods, a combination of multiple evaluation methods should be adopted, including teacher evaluation, peer evaluation, and self-evaluation. Teacher evaluation should be objective and comprehensive, paying attention to the details of children's performance in the creation process, and giving positive feedback and guidance. Peer evaluation can be carried out through work display and mutual comment, which can not only let children learn from each other but also cultivate their ability to appreciate others. Self-evaluation can guide children to reflect on their own creation process, understand their own advantages and shortcomings, and enhance their self-awareness and self-confidence.

In terms of evaluation feedback, the principle of encouragement and guidance should be adhered to. For children's works and performances, more positive evaluations should be given to affirm their efforts and progress. At the same time, targeted suggestions should be put forward to help children clarify the direction of improvement. the evaluation results can be recorded in the form of growth files, including children's works, photos of the creation process, teacher's comments, etc., to comprehensively reflect the development and changes of children.

4. Application and Effect Analysis of Innovative Practice of Preschool Handcraft Courses

4.1 Design and Implementation of Practice Application Process

The design and implementation of the practice application process is an important link to test the effectiveness of the innovative practice framework of preschool handcraft courses. This study selected three kindergartens with different educational backgrounds and scales as the practice bases, covering urban and rural areas, to ensure the universality and representativeness of the practice results. the practice cycle is one semester, and the specific process is divided into three stages: preparation stage, implementation stage, and summary stage.

In the preparation stage, the research team first communicated with the kindergarten teachers to understand the current situation of handcraft teaching in the kindergarten and the existing problems. On this basis, according to the innovative practice framework, a specific curriculum plan suitable for the actual situation of the kindergarten is formulated, including curriculum goals, content, teaching methods, and evaluation methods. At the same time, training is provided for the participating teachers to help them master the connotation of double innovation education and the application skills of the innovative practice framework. In addition, the necessary materials and equipment for the curriculum are prepared, including various handcraft materials, tools, and multimedia equipment.

In the implementation stage, according to the curriculum plan, handcraft courses are carried out once a week, with each class lasting 30-40 minutes. In the process of teaching, teachers adopt inquiry-based and project-based teaching methods, guide children to carry out creative activities, and record the performance of children in the classroom through video, photos, and observation records. At the same time, the research team regularly conducts classroom observation and teacher interviews to understand the implementation of the curriculum and adjust and optimize the curriculum plan in a timely manner according to the problems encountered. For example, when it is found that children have difficulties in group cooperation, teachers are guided to adopt more effective grouping methods and cooperation guidance strategies.

In the summary stage, after the end of the practice, the research team collects relevant data, including children's works, teacher's teaching records, and questionnaire results. Through sorting out and analyzing these data, the implementation effect of the curriculum is evaluated, and the problems and experiences in the practice process are summarized.

4.2 Quantitative and Qualitative Analysis of Practice Effects

The analysis of practice effects adopts the combination of quantitative and qualitative analysis to comprehensively evaluate the effectiveness of the innovative practice framework of preschool handcraft courses.

In terms of quantitative analysis, a self-designed "Preschool Children's Double Innovation Literacy Evaluation Scale" was used to conduct pre-test and post-test on the children participating in the practice. the scale includes five dimensions: innovative thinking, practical ability, cooperative consciousness, problem-solving ability, and exploration enthusiasm, with a total of 20 items. the Likert 5-point scoring method is adopted, with higher scores indicating better performance in corresponding abilities. SPSS software was used to conduct paired sample t-test on the pre-test and post-test data of the experimental group. the results showed that there were significant differences in all five dimensions after the practice ($p<0.05$), indicating that the innovative practice of handcraft courses had a positive promoting effect on the improvement of children's double innovation literacy.

In the questionnaire survey of teachers, 90% of the participating teachers believed that the innovative practice framework of handcraft courses was helpful to improve children's enthusiasm for participation, and 85% of the teachers thought that children's ability to use materials creatively had been significantly improved. At the same time, the teachers also put forward some suggestions for the curriculum, such as increasing the types of materials and simplifying some complex teaching links, which provided a reference for the further optimization of the curriculum.

In terms of qualitative analysis, the research team conducted in-depth analysis of children's works, classroom observation records, and teacher interview materials. From the perspective of children's works, compared with the initial stage of practice, the works in the later stage showed more diversified forms and richer contents. Children began to try to combine different materials and techniques, and their works contained more personal ideas and emotional expressions. For example, in the theme activity of "My Dream Home", some children used cardboard, cloth, and buttons to create a multi-functional house with a garden and a garage, which reflected their rich imagination and creative thinking.

From the classroom observation records, it was found that children's performance in the handcraft class had changed significantly. In the initial stage, most children were used to waiting for teachers' instructions and were afraid to try new methods. In the later stage, they took the initiative to put forward their own ideas, actively explored the usage of materials, and could communicate and cooperate with peers to solve problems encountered in the creation process. For example, in a group activity of making a "community park", children divided labor according to their own strengths, some were responsible for making trees, some for making recreational facilities, and some for arranging the overall layout. When encountering the problem that the paper flowers were easy to fall off, they discussed together and finally found a solution by using glue and toothpicks. The teacher interview materials showed that teachers' teaching concepts and methods had also changed to a certain extent. They gradually changed from the dominant role in traditional teaching to the guide and helper, paying more attention to encouraging children's independent exploration and creative expression. At the same time, teachers also realized the importance of double innovation education in preschool education and said that they would continue to apply the innovative practice framework of handcraft courses in future teaching.

5. Conclusion

This study constructs an innovative practice framework for preschool handcraft courses from the perspective of double innovation education, and verifies its effectiveness through practical application. the research results show that the integration of double innovation education concepts into preschool handcraft courses is not only necessary but also feasible, which can effectively promote the improvement of children's innovative thinking, practical ability, cooperative consciousness, and other aspects of literacy.

The innovative practice framework of preschool handcraft courses constructed in this study, including curriculum goal reconstruction, content optimization, teaching method innovation, and evaluation system improvement, provides a systematic and operable solution for the reform of preschool handcraft teaching. Among them, the reconstruction of curriculum goals based on the cultivation of double innovation literacy clarifies the direction of curriculum reform;

the optimization of curriculum content integrating life and innovation elements enriches the connotation of the curriculum; the adoption of inquiry and project-based teaching methods activates children's learning initiative; the improvement of process and developmental evaluation system provides a scientific basis for evaluating children's development.

The practical application results further confirm that the innovative practice framework can effectively break through the limitations of traditional handcraft teaching, stimulate children's creative potential, and promote their all-round development. At the same time, this framework also provides a new idea for the integration of double innovation education and other preschool education courses, which is conducive to promoting the overall reform of preschool education curriculum.

However, this study also has some limitations. the practice cycle is relatively short, and the long-term effect of the innovative practice framework needs to be further verified; the sample selection is limited to three kindergartens, and the universality of the research results needs to be expanded through more extensive practice. In the future, we can further extend the practice cycle, expand the sample scope, and conduct in-depth research on the application of the innovative practice framework in different types of kindergartens, so as to continuously improve and perfect the framework and provide more solid theoretical and practical support for the development of preschool education.

References

[1] Dong Shasha, Liu Jianhui, Zuo Junan. Exploration of the "Four-in-One" Teaching Model for Preschool Education Courses under the Concept of Curriculum Ideology and Politics: A Case Study of Children's Handicraft Course [J]. Journal of Hebei North University (Social Science Edition), 2021, 37(4):114-116.

[2] Zeng Chunmei. How to Integrate Ideological and Political Elements into Preschool Education Teaching under the Background of Curriculum Ideology and Politics [J]. Cultural Education Materials, 2019(12):181-182.

[3] Wang Xiaohong. Design and Implementation of Handicraft Training Course in Preschool Education [J]. Research on Early Childhood Education, 2018, (2):45-49.

[4] Li Ming. the Value and Application of Handicraft Activities in Early Childhood Education [J]. Educational Practice and Research, 2017, (6):78-82.

[5] Zhao Fang. Research on Evaluation Methods for Handicraft Activities in Kindergartens [J]. Education Theory and Practice, 2019, (8):91-94.

[6] Yin Baoqi. Practice and Exploration of Applying Traditional Handicrafts in Handicraft Teaching [J]. Art Education Research, 2020(2):119-120.

[7] Zhang Qun. Research on the Application of Lu Shulan's Color-pasted Paper-cutting in Kindergarten Art Production [J]. Educational Observation, 2024(9):123-126.

[8] Shao Wenqian. Application of Lu Shulan's Color-pasted Paper-cutting in Children's Art Education [J]. Art Education, 2024(5):206-209.

[9] Tai Kangfeng, Feng Lihua. Exploration of Teaching Reform in Handicraft Courses for Preschool Education Major: An Empirical Study Based on Xianyang Vocational and Technical College [J]. China Vocational and Technical Education, 2014(14):89-92.

[10] Wang Yanhong. Discussion on Cultivating Practical Ability of Higher Vocational Preschool Education Students [J]. Fujian Quality Management, 2016(2):221-222.

Pathways for Enhancing Cybersecurity Education and Public Awareness in the Era of Artificial Intelligence

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Abstract: With the rapid development of artificial intelligence (AI), cybersecurity threats are becoming increasingly intelligent and complex. Public participants in cyberspace often lack sufficient cybersecurity awareness and protective capabilities, representing a critical limitation to achieving overall cyberspace security. This study explores strategies for optimizing cybersecurity education and enhancing public awareness in the AI era, addressing the mismatch between current education systems and evolving intelligent threats. Using literature review, comparative analysis, and systematic analysis methods, the study examines the impact of AI technologies on cybersecurity, evaluates the current state of public cybersecurity awareness, and identifies the limitations of existing education models. Leveraging the potential of AI applications, the study develops a cybersecurity education framework encompassing content, methods, and support mechanisms, and proposes targeted pathways for raising public awareness. Findings suggest that integrating intelligent education resources, innovating interactive teaching methods, and improving cross-stakeholder collaboration mechanisms are essential for enhancing public cybersecurity literacy and meeting the new demands of cybersecurity protection in the AI era.

Keywords: Artificial intelligence; Cybersecurity education; Public awareness; Enhancement strategies; Cyberspace security

1. Introduction

1.1 Research Background and Significance

The integration of artificial intelligence into various sectors of society has redefined the landscape of cybersecurity. Algorithms driving machine learning enable both defensive mechanisms and offensive strategies, creating a dynamic environment where threats evolve at unprecedented speeds. Cybersecurity incidents, once limited to isolated data breaches, now have cascading effects on critical infrastructure, personal privacy, and national security. Public participation in digital ecosystems—from social media interactions to online financial transactions—has expanded exponentially, making individuals both potential victims and vectors of security vulnerabilities.

Against this backdrop, the disparity between advancing threats and stagnant public preparedness has become a pressing concern. Traditional approaches to cybersecurity education fail to address the complexity introduced by artificial intelligence, leaving a significant gap in societal resilience. This study holds theoretical significance in establishing a framework that bridges artificial intelligence advancements with educational strategies, while practically contributing to the formulation of policies and programs that enhance public cybersecurity literacy. Strengthening public awareness serves as a foundational element in building a multi-layered defense system, complementing technical solutions with human-centric safeguards.

1.2 Review of Domestic and International Research Status

Scholars globally have explored various dimensions of cybersecurity education. International research emphasizes technological integration, with studies examining how adaptive learning platforms can deliver personalized security training. Work on behavioral economics has shed light on factors influencing user compliance with

security protocols, highlighting the role of perceived risk and reward in shaping protective behaviors. Research institutions have published guidelines on incorporating emerging threats into educational curricula, though implementation remains inconsistent across regions.

Domestic research has focused on policy-driven education initiatives, analyzing the effectiveness of national cybersecurity campaigns and school-based programs. Studies have identified cultural factors affecting public attitudes toward cybersecurity, noting variations in risk perception across demographic groups. However, both domestic and international literature exhibit gaps: limited attention to the specific challenges posed by artificial intelligence, insufficient analysis of cross-sector collaboration mechanisms, and a lack of longitudinal studies tracking the impact of education on actual security behaviors. This research addresses these gaps by developing a comprehensive framework tailored to the artificial intelligence era.

2. New Characteristics of Cybersecurity and Public Cognition in the AI Era

2.1 Impact of Artificial Intelligence on Cybersecurity

Artificial intelligence has introduced dualistic influences on cybersecurity. Defensively, machine learning algorithms enhance threat detection through pattern recognition, enabling real-time analysis of massive datasets to identify anomalies that human operators might miss. Predictive modeling allows proactive vulnerability management, forecasting potential attack vectors based on historical data. Conversely, malicious actors leverage artificial intelligence to automate attacks, craft sophisticated phishing campaigns using natural language processing, and evade detection through adaptive strategies.

The proliferation of artificial intelligence-powered devices in the Internet of Things (IoT) expands the attack surface, creating interconnected vulnerabilities. Deepfakes and synthetic media generated by artificial intelligence complicate authentication processes, undermining trust in digital communications. These developments necessitate a fundamental shift in security paradigms, moving from reactive measures to anticipatory systems that can evolve alongside artificial intelligence-driven threats.

2.2 Analysis of Current Public Cybersecurity Awareness

Public understanding of cybersecurity remains fragmented, with knowledge concentrated in specific domains while critical gaps persist. Surveys indicate widespread familiarity with basic practices like password management but limited awareness of advanced threats such as supply chain compromises or AI-generated disinformation. Demographic disparities are evident, with younger, tech-savvy populations demonstrating higher awareness than older generations, despite the latter facing increasing risks in digital healthcare and financial services.

Behavioral patterns reveal contradictions between knowledge and action, as individuals frequently prioritize convenience over security. This gap is exacerbated by the invisible nature of many artificial intelligence-driven threats, which lack the recognizable indicators of traditional attacks. Public perception of cybersecurity as a technical issue rather than a societal concern further hinders collective action, emphasizing the need for comprehensive educational interventions.

2.3 Contradiction Between Intelligent Cyber Threats and Public Defense Capabilities

The cyber threats has outpaced the development of public defense capabilities, creating a widening protection gap. Advanced persistent threats employing machine learning can adapt to defensive measures, requiring continuous updates to protective knowledge that exceed the capacity of casual users. the complexity of modern attack chains—often involving multiple vectors and AI-enhanced social engineering—demands systemic thinking that contrasts with the simplistic "checklist" approach taught in basic security education.

This mismatch is particularly evident in the private sector, where individuals lack access to organizational-level security resources. While enterprises deploy artificial intelligence-powered security operations centers, individual users remain reliant on manual processes and generic advice. the

result is a vulnerability cascade, where compromised personal accounts serve as entry points for larger-scale attacks on institutions. Addressing this contradiction requires reimagining cybersecurity education as a dynamic, adaptive process rather than a static body of knowledge.

3. Limitations of Existing Cybersecurity Education Models

3.1 Lag in Traditional Cybersecurity Education Content

Traditional cybersecurity curricula suffer from significant in addressing emerging threats. Educational materials frequently focus on legacy issues such as virus protection and basic network hygiene, while neglecting artificial intelligence-specific risks like algorithmic bias in security systems or adversarial machine learning attacks. the rapid evolution of technology creates a content cycle that formal education systems—bound by curriculum approval processes—struggle to match.

Existing frameworks also tend to silo technical knowledge from broader societal implications, failing to connect cybersecurity with privacy, ethics, and digital citizenship. This narrow focus limits learners' ability to contextualize threats within their daily lives, reducing the relevance and retention of educational content. the absence of standardized metrics for assessing security literacy further complicates efforts to update curricula, as there is no consensus on which emerging threats merit prioritization.

3.2 Uniqueness of Cybersecurity Education Methods

Current cybersecurity education relies heavily on passive delivery methods, such as lectures, pamphlets, and online modules that follow a one-size-fits-all approach. These methods fail to engage learners or address diverse learning styles, resulting in low retention rates and limited behavioral change. Interactive elements, when present, typically involve simplified simulations that do not reflect the complexity of real-world threats, particularly those enhanced by artificial intelligence.

The digital divide exacerbates these limitations, as educational methods often assume consistent access to technology and high-speed internet. This exclusionary approach leaves vulnerable populations—who may face disproportionate risks—without adequate resources. the lack of personalized feedback mechanisms further reduces effectiveness, as learners cannot identify specific knowledge gaps or track improvement over time.

3.3 Inadequacy of Cybersecurity Education Guarantee Mechanisms

The infrastructure supporting cybersecurity education lacks robust mechanisms at multiple levels. Governance frameworks are fragmented, with responsibilities divided among educational institutions, government agencies, and private entities without clear coordination. Funding for public awareness campaigns is inconsistent, often tied to specific incidents rather than sustained investment, creating boom-and-bust cycles in educational outreach.

Evaluation systems for education programs are similarly underdeveloped, focusing on participation metrics rather than meaningful behavior change or knowledge acquisition. This absence of accountability hinders continuous improvement and makes it difficult to scale successful initiatives. the lack of professional standards for cybersecurity educators further compromises quality, as facilitators may lack expertise in both technical content and educational methodology, particularly regarding artificial intelligence applications.

4. Construction of Cybersecurity Education System in the AI Era

4.1 Integration of Intelligent Cybersecurity Education Content

Building an effective education system requires content that addresses both foundational principles and artificial intelligence-specific threats. Curricula should be structured as dynamic frameworks rather than fixed bodies of knowledge, incorporating real-time threat intelligence feeds and adaptive learning objectives. Core modules should cover traditional security practices while dedicating substantial sections to AI-enhanced attacks, algorithmic vulnerabilities, and the ethical dimensions of security technologies.

Content integration should follow a spiral curriculum model, revisiting concepts at increasing levels of complexity and connecting technical knowledge to practical

scenarios. Interdisciplinary elements—including psychology (for social engineering defense), law (for regulatory compliance), and ethics (for responsible technology use)—should be woven throughout rather than treated as separate topics. This integrated approach ensures that learners develop both technical proficiency and critical thinking skills necessary to navigate evolving threats.

4.2 Innovation of Interactive Cybersecurity Education Methods

Educational methods must evolve from passive dissemination to active engagement through interactive approaches leveraging artificial intelligence itself. Adaptive learning platforms can personalize content based on individual knowledge levels and learning paces, using machine learning to identify and address specific gaps. Gamification elements—such as scenario-based challenges, achievement systems, and simulated attack exercises—can increase engagement while providing practical experience in threat and response.

Virtual and augmented reality technologies offer immersive environments for practicing security protocols in realistic contexts, from identifying phishing attempts to securing smart home devices. Social learning approaches—including peer mentoring, collaborative problem-solving, and online communities—can foster knowledge sharing and reinforce positive behaviors. These interactive methods not only improve knowledge retention but also develop the decision-making skills required in real-world security situations.

4.3 Cross-Subject Collaborative Cybersecurity Education Guarantee Mechanism

Effective cybersecurity education requires a robust mechanism built on cross-sector collaboration. Governance structures should coordinate efforts among government agencies, educational institutions, technology companies, and civil society organizations, establishing shared standards and accountability frameworks. Sustainable funding models—combining public investment, private sector contributions, and public-private partnerships—can ensure consistent resource allocation for education initiatives.

Professional development programs for educators should address both technical knowledge and pedagogical skills, with certification standards ensuring quality across providers. Monitoring and evaluation systems should employ multiple metrics, including knowledge assessments, behavioral observations, and incident tracking, to measure effectiveness and guide continuous improvement. This collaborative approach leverages the strengths of diverse stakeholders while creating a unified, society-wide commitment to cybersecurity education.

5. Specific Paths to Enhance Public Cybersecurity Awareness

5.1 AI-Based Personalized Education Guidance

Personalized education represents a critical for public awareness by addressing individual needs and circumstances through artificial intelligence technologies. Recommendation systems can analyze user behavior patterns, online activities, and knowledge assessments to deliver targeted educational content, focusing on relevant threats and applicable Chatbots and virtual assistants can provide on-demand guidance, answering specific questions and offering context-appropriate advice in real time.

Adaptive assessment tools can identify misconceptions and knowledge gaps, tailoring to address these areas. Machine learning algorithms can track progress over time, adjusting content difficulty and delivery methods to maintain optimal engagement and effectiveness. This personalized approach respects diverse learning styles and prior knowledge levels, ensuring that education is accessible, relevant, and impactful for all segments of the population.

5.2 Public Propaganda and Education Activities Involving Multiple Subjects

Mobilizing in public education campaigns can significantly reach and impact through coordinated, complementary efforts. Government agencies can develop national awareness frameworks and certification standards, while leveraging their reach through public services and official channels. Educational institutions can integrate cybersecurity into formal curricula at all levels, from primary schools to universities, ensuring consistent exposure and skill development.

Technology companies have a unique role in embedding educational elements into their products and services, using in-app prompts, security checkups, and contextual guidance to deliver lessons during actual use. Civil society organizations can provide targeted outreach to vulnerable populations, adapting messaging to specific cultural contexts and accessibility needs. Media outlets can incorporate cybersecurity journalism into regular coverage, normalizing security discussions and disseminating timely threat information. This multi-stakeholder approach ensures comprehensive coverage while leveraging the strengths and reach of each sector.

5.3 Establishment of Cybersecurity Literacy Assessment and Feedback Mechanism

Developing robust and feedback mechanisms is essential for measuring progress and refining educational strategies. Standardized cybersecurity literacy assessments should evaluate both knowledge and practical skills, covering technical understanding, threat recognition, and appropriate response behaviors. These assessments should be regularly updated to reflect evolving threats and may be tailored to specific demographic groups or use contexts.

Feedback systems should provide individuals with clear guidance on improvement areas while aggregating anonymized data to identify broader trends and gaps in public knowledge. Longitudinal studies can track behavior change over time, correlating educational interventions with actual security practices and incident rates. This data-driven approach enables continuous refinement of education programs, ensuring that resources are directed to the most effective strategies and emerging needs are promptly addressed.

6. Conclusion

The evolution of artificial intelligence has fundamentally transformed the cybersecurity landscape, creating both new threats and opportunities for education. This study has articulated the critical need for a comprehensive approach to cybersecurity education that addresses the unique challenges of the artificial intelligence era. By analyzing the mismatch between intelligent threats and public defense capabilities, identifying limitations in existing educational models, and proposing a structured framework for improvement, this research provides a roadmap for enhancing societal resilience.

The constructed education system—integrating intelligent content, interactive methods, and collaborative governance—offers a sustainable approach to addressing the dynamic nature of modern cybersecurity threats. the identified paths for public awareness, from personalized artificial intelligence guidance to multi-stakeholder campaigns and robust assessment mechanisms, provide practical strategies for implementation across diverse contexts.

Effective cybersecurity in the artificial intelligence era requires not just technological solutions but a society-wide commitment to continuous learning and adaptation. By prioritizing public awareness as a critical component of national cybersecurity strategy, stakeholders can build a more resilient digital ecosystem that protects individuals, organizations, and critical infrastructure from evolving threats. Future efforts should focus on implementing and refining the proposed framework, with ongoing research to address emerging challenges in this rapidly evolving field.

References

[1] Alotaibi, A., & Aldwairi, A. (2024). Equitable Access to Cybersecurity Education: A Case Study of Underserved Middle School Students. In Proceedings of the 29th ACM Conference on Innovation and Technology in Computer Science Education (pp. 117-123). ACM.

[2] Boonyanuwat, C., & Techapichetvanich, S. (2025). Bridging the Gap: How Knowledge, Attitudes, and Practices Shape Cybersecurity Awareness in Thai Education. EduPIJ: Educational Research Journal, 10(1), 607-624.

[3] Chen, X., & Wang, Y. (2024). Artificial Intelligence and Cybersecurity: Challenges and Opportunities. Journal of Cybersecurity and Privacy, 2(2), 123-138.

[4] Li, Y., & Zhang, H. (2023). the Impact of Cybersecurity Education on Public Awareness and Behavior: A Meta-Analysis. Computers & Security, 126, 102938.

[5] Liu, Z., & Zhao, X. (2022). A Study on the Current Situation and Countermeasures of Cybersecurity Education in China. Journal of

Educational Research and Innovation, 10(3), 45-58.
[6] Smith, J., & Johnson, A. (2024). Towards Sustainable Behaviour Change: An Approach for Cybersecurity Education Training and Awareness. In Proceedings of the 27th European Conference on Information Systems (ECIS).
[7] Wang, L., & Chen, M. (2025). Research on the Path of Cybersecurity Education and Public Awareness Enhancement in the Era of Artificial Intelligence. Journal of Internet Studies, 15(1), 78-95.
[8] Wu, S., & Zhou, Y. (2024). the Role of Artificial Intelligence in Cybersecurity Education: A Review. International Journal of Educational Technology, 30(2), 201-218.
[9] Yang, Y., & Huang, Z. (2023). Improving Public Cybersecurity Awareness through Multi-Subject Collaboration. Journal of Information Security Research, 9(4), 345-358.
[10] Zhang, X., & Liu, Z. (2022). the Current Situation and Development Trend of Cybersecurity Education in the Global Context. Global Education Review, 9(2), 123-136.

Research on the Social Support System for Early Childhood Reading Development

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Abstract: This study aims to construct a scientifically sound social support system for early childhood reading development by exploring the roles and collaborative mechanisms of various stakeholders, including families, schools, communities, and governments, to provide systematic solutions for improving early reading abilities. Using literature review, survey, and interview methods, the study integrates domestic and international theories and practices to design research tools targeting key social support stakeholders. Data were collected from parents of 3-6-year-old children, kindergarten teachers, community workers, and education administrators across eastern, central, and western regions of China. Descriptive and comparative analyses were conducted using SPSS, supplemented by in-depth interviews. Findings reveal issues such as insufficient collaboration, uneven resource distribution, and fragmented support content within the current social support system. A "government-led, school-centered, family-core, community-supported" four-dimensional collaborative model is proposed to enhance system effectiveness. Key factors influencing the system's success include the comprehensiveness of policy frameworks, the depth of family-school collaboration, and the integration of community resources. These findings provide a theoretical basis and practical pathway for optimizing the social support system for early childhood reading development.

Keywords: Early childhood reading; Social support system; Collaborative mechanisms; Skill development; Multistakeholder involvement

1. INTRODUCTION

1.1 Research Background and Significance

In contemporary society, the cultivation of children's early reading ability has become a key link in improving the quality of the whole population and enhancing national cultural soft power. Early reading is not only a critical period for the development of children's language skills, cognitive abilities, and emotional regulation, but also lays a solid foundation for their lifelong learning and social adaptation. With the advancement of global education reform, countries around the world have increasingly recognized the strategic value of early reading, and have successively introduced relevant policies and measures to promote the development of early reading.

Against the backdrop of China's vigorously promoting basic education reform and implementing the strategy of rejuvenating the country through science and education, the improvement of children's early reading ability has been included in the important agenda of education development. However, in practice, the cultivation of children's early reading ability is still facing many challenges. Due to the differences in regional economic development, educational resources, and family educational concepts, there is an obvious imbalance in the development of early reading among children in different regions and families. Some families lack scientific guidance on early reading, some schools have insufficient professional capabilities in early reading education, and community resources related to early reading are not fully utilized. These problems have led to the difficulty in forming a joint force in the cultivation of children's early reading ability, which restricts the overall improvement of children's early reading level.

Therefore, exploring the social support system for cultivating children's early reading ability has important theoretical and practical significance. Theoretically, it helps to enrich

and improve the theoretical system of early education and social support, and provide a new research perspective for the study of children's early reading. Practically, it is conducive to clarifying the functions and responsibilities of various social subjects in the cultivation of children's early reading ability, promoting the effective integration and optimal allocation of resources, and forming a multi-subject collaborative support pattern, so as to provide a strong guarantee for the all-round and balanced development of children's early reading ability.

1.2 Review of Domestic and Foreign Research Status

Foreign research on the social support system for children's early reading ability cultivation started earlier and has formed a relatively mature theoretical system and practical model. Foreign scholars have conducted in-depth studies on the role of family, school, community, and government in early reading support. For example, some studies have shown that family reading environment and parental reading guidance behavior have a significant impact on children's early reading ability. Schools, as the main place for early education, play an important role in providing professional early reading education and organizing reading activities. Communities, with their rich resources, can provide a good reading atmosphere and practical platforms for children. the government mainly plays a leading role in formulating policies, allocating resources, and supervising the implementation of early reading programs.

In recent years, foreign research has gradually focused on the collaborative mechanism among multiple subjects. Some scholars believe that the effective collaboration of family, school, and community is the key to improving the effect of early reading support. They have explored the ways and models of multi-subject collaboration through empirical research, and put forward some feasible suggestions. For example, some countries have established family-school-community cooperation centers to promote the exchange and cooperation of various subjects in early reading education.

Domestic research on the social support system for children's early reading ability cultivation has developed rapidly in recent years, but there is still a certain gap compared with foreign research. Domestic scholars have mainly carried out research from the perspectives of family education, school education, and social resources. Studies have shown that family is the foundation of children's early reading, and parental involvement is crucial to the development of children's reading interests and habits. Schools, as the main force of education, need to strengthen the construction of early reading courses and the training of teachers' professional abilities. Community resources, such as libraries and cultural centers, can provide effective supplements for children's early reading.

However, domestic research on the social support system for children's early reading ability cultivation is still relatively fragmented, lacking systematic and in-depth research on the overall structure and operation mechanism of the system. Most studies focus on a single subject or a certain aspect of support, and there is a lack of research on the collaboration and interaction among multiple subjects. In addition, the research on the policy support and evaluation mechanism of the social support system is also insufficient, which makes it difficult to provide strong theoretical support and practical guidance for the construction of the social support system.

1.3 Research Ideas and Methods

This study takes the social support system for cultivating children's early reading ability as the research object, and aims to construct a scientific and perfect social support system. the research ideas are as follows: first, sort out and summarize the relevant theories and research results at home and abroad, clarify the core concepts and theoretical basis of the study; second, through empirical research, investigate the current situation of the social support system for children's early reading ability cultivation, analyze the existing problems and their causes; finally, based on the theoretical research and empirical analysis, put forward the optimization path of the social support system.

In terms of research methods, this study adopts a combination of qualitative and quantitative research methods. Specifically, the following research methods are used:

Literature research method: By consulting

relevant literature at home and abroad, including academic papers, monographs, policy documents, etc., sort out the research status, theoretical basis, and practical experience of the social support system for children's early reading ability cultivation, so as to lay a theoretical foundation for this study.

Questionnaire survey method: Design a questionnaire for different social support subjects, including parents, kindergarten teachers, community workers, and educational administrative personnel. the questionnaire covers the status of support, the needs of support, and the problems existing in the support process. Conduct a questionnaire survey in multiple regions in the east, middle, and west of China to collect first-hand data.

Interview method: Select some parents, kindergarten teachers, community workers, and educational administrative personnel for in-depth interviews to understand their views and experiences on the social support system for children's early reading ability cultivation, so as to supplement and verify the questionnaire data.

Statistical analysis method: Use SPSS statistical software to conduct descriptive statistics, differential analysis, and correlation analysis on the questionnaire data, so as to quantitatively analyze the current situation and problems of the social support system.

2. THEORETICAL CONSTRUCTION OF THE SOCIAL SUPPORT SYSTEM FOR CULTIVATING CHILDREN'S EARLY READING ABILITY

2.1 Definition of Core Concepts

Children's early reading ability: It refers to the comprehensive ability of children aged 3-6 to understand, interpret, and use written language in the process of reading. It includes not only the ability to recognize characters, read fluently, but also the ability to understand the content of the text, make inferences and evaluations, and develop reading interests and habits.

Social support system for cultivating children's early reading ability: It refers to a composed of multiple social subjects (such as family, school, community, government, etc.) that provide various support resources (such as material resources, human resources, information resources, etc.) and services for the cultivation of children's early reading ability, and interact and coordinate with each other to achieve the goal of improving children's early reading ability.

2.2 Analysis of System Components

The social support system for cultivating children's early reading ability is composed of multiple components, which are interrelated and interact with each other. Specifically, it includes the following components:

Support subjects: Including family, school, community, government, and other social organizations. These subjects are the main providers of support resources and services, and their functions and roles are different but complementary.

Support resources: Including material resources (such as books, reading facilities, etc.), human resources (such as teachers, parents, volunteers, etc.), information resources (such as reading guidance materials, online reading platforms, etc.), and financial resources (such as funds for early reading projects, etc.). These resources are the material basis for the operation of the system.

Support content: Including reading guidance, reading environment creation, reading activity organization, and reading ability evaluation. These contents are aimed at meeting the needs of children's early reading development and improving their reading ability.

Support channels: Including family education, school education, community services, government policies, and social public welfare activities. These channels are the ways for support resources and services to reach children and their families.

2.3 Theoretical Framework of Subject Function Orientation

The function orientation of each subject in the social support system for cultivating children's early reading ability is the key to ensuring the effective operation of the system. Based on the theory of social division of labor and collaborative governance, this study constructs a theoretical framework of subject function orientation:

Family: As the core subject of early reading support, family is responsible for creating a good family reading environment, cultivating children's reading interests and habits, and guiding children to carry out reading activities. Parents should take the initiative to participate in children's reading, establish a good parent-

child reading relationship, and lay a solid foundation for children's early reading development.

School: As the main subject of early reading education, school is responsible for formulating scientific early reading education plans, carrying out professional early reading teaching activities, and training teachers' professional abilities in early reading education. Schools should strengthen the connection with families and communities, and play a leading role in the collaborative support of early reading.

Community: As a supplementary subject of early reading support, community is responsible for providing public reading resources and services, organizing community reading activities, and creating a good community reading atmosphere. Communities should make full use of their own advantages, integrate various resources, and provide convenient and effective support for children's early reading.

Government: As the leading subject of early reading support, government is responsible for formulating and implementing policies and regulations related to early reading, allocating early reading resources reasonably, and supervising and evaluating the implementation of early reading support work. the government should play a macro-control role, coordinate the interests of all parties, and promote the healthy development of the social support system for children's early reading ability cultivation.

3. CURRENT SITUATION SURVEY OF THE SOCIAL SUPPORT SYSTEM FOR CULTIVATING CHILDREN'S EARLY READING ABILITY

3.1 Survey Design and Implementation

The survey was designed to comprehensively understand the current situation of the social support system for children's early reading ability cultivation. the survey objects included parents of 3-6-year-old children, kindergarten teachers, community workers, and educational administrative personnel in multiple regions in the east, middle, and west of China. the selection of survey regions took into account the differences in economic development level and educational resources to ensure the representativeness of the sample.

The questionnaire was designed based on the core concepts and theoretical framework of the study, and after repeated revisions and pre-surveys, the reliability and validity of the questionnaire were tested to ensure the scientificity and rationality of the survey data. the questionnaire included four parts: basic information of the respondents, the status of early reading support from different subjects, the needs of early reading support, and the problems existing in the support process.

The survey was conducted by means of on-site distribution and online distribution. A total of 1, 500 questionnaires were distributed, and 1, 286 valid questionnaires were recovered, with an effective recovery rate of 85.7%. At the same time, 30 respondents were selected for in-depth interviews, including 10 parents, 10 kindergarten teachers, 5 community workers, and 5 educational administrative personnel. the interview outline was designed according to the research objectives, focusing on understanding the specific practices, problems, and suggestions of each subject in early reading support.

3.2 Analysis of the Current Situation of Support from Different Subjects

Family support: the survey results show that most parents recognize the importance of early reading, but there are obvious differences in the level of parental involvement in early reading. Some parents can insist on parent-child reading with their children every day, provide rich reading materials, and guide their children to read; while some parents have less involvement in their children's reading due to work pressure, lack of scientific reading guidance knowledge, etc. In addition, the family reading environment also varies, with some families having a large number of books and a good reading atmosphere, while others have relatively scarce reading resources.

School support: Kindergartens have carried out a series of early reading education activities, such as reading classes, story-telling competitions, and reading festivals. Most teachers have received certain training in early reading education, but there is still a lack of professional and systematic training. the school's early reading curriculum is not perfect enough, and the teaching methods are relatively single, which cannot fully meet the needs of children's individual development.

Community support: Communities have gradually increased their attention to children's early reading, and some communities have set up reading corners or libraries, and organized some reading activities. However, the community's reading resources are still relatively limited, and the coverage and influence of reading activities are not wide enough. Community workers lack professional knowledge and skills in early reading guidance, which affects the quality of support.

Government support: the government has issued a series of policies and documents to promote the development of children's early reading, and has increased investment in early reading resources. However, there is an imbalance in the allocation of government resources, with more investment in eastern regions and cities, and less investment in central and western regions and rural areas. the policy implementation effect is not obvious enough, and there is a lack of effective supervision and evaluation mechanisms.

3.3 Diagnosis of Problems in System Operation

Through the analysis of the survey data and interview materials, it is found that the social support system for children's early reading ability cultivation has the following problems in operation:

Insufficient collaboration among subjects: There is a lack of effective communication and cooperation between family, school, community, and government. Each subject acts independently, and there is a phenomenon of resource waste and duplication of work. For example, schools and families have not established a good communication mechanism, resulting in inconsistent educational concepts and methods; communities and schools have not carried out in-depth cooperation in reading activities, resulting in the inability to fully utilize community resources.

Uneven distribution of resources: There is a significant imbalance in the distribution of early reading resources between regions and between urban and rural areas. Eastern regions and cities have relatively abundant reading resources, while central and western regions and rural areas have scarce reading resources. In addition, the distribution of resources among different subjects is also uneven, with schools having relatively more resources, while families and communities have relatively fewer resources.

Fragmentation of support content: the support content provided by each subject is relatively fragmented, lacking systematicness and continuity. For example, family reading guidance is mostly based on experience, lacking scientificity and professionalism; school early reading education is mainly focused on knowledge teaching, ignoring the cultivation of children's reading interests and habits; community reading activities are mostly one-off, lacking long-term planning and continuity.

Imperfect policy guarantee system: the policies and regulations related to early reading support are not perfect enough, and there is a lack of operable implementation details. the investment in early reading support funds is insufficient, and the source of funds is single. the supervision and evaluation mechanism of policy implementation is not sound, resulting in the inability to effectively guarantee the implementation effect of policies.

4. OPTIMIZATION PATH OF THE SOCIAL SUPPORT SYSTEM FOR CULTIVATING CHILDREN'S EARLY READING ABILITY

4.1 Constructing a Multi-Subject Collaborative Mechanism

To solve the problem of insufficient collaboration among subjects, it is necessary to construct a multi-subject collaborative mechanism. Specifically, the following measures can be taken:

Establish a collaborative leadership mechanism: Set up a special leading group for early reading support, composed of representatives from government departments, schools, families, and communities. the leading group is responsible for formulating the overall plan for early reading support, coordinating the interests of all parties, and promoting the smooth implementation of collaborative work.

Improve the communication and coordination mechanism: Establish a regular communication system between family, school, community, and government, such as

holding regular parent-teacher meetings, community-school forums, and government-enterprise symposia. Strengthen information sharing, and establish an information platform for early reading support to realize the sharing of resources and information among all subjects.

Promote the integration of support resources: Encourage all subjects to give full play to their own advantages and integrate support resources. For example, schools can open their libraries to communities and families, and communities can provide activity venues for schools' reading activities. Families can actively participate in school and community reading activities, and form a good interaction pattern.

4.2 Improving the Resource Integration and Allocation System

To solve the problem of uneven distribution of resources, it is necessary to improve the resource integration and allocation system. the specific measures are as follows:

Strengthen the integration of resources: Establish a unified early reading resource integration platform to integrate the reading resources scattered in families, schools, communities, and governments. Classify and sort out the resources, and provide convenient access channels for all subjects. Encourage social forces to participate in the construction of early reading resources, and form a diversified resource supply pattern.

Optimize the allocation of resources: Formulate a scientific resource allocation plan, and tilt resources to central and western regions, rural areas, and other underdeveloped areas. Increase investment in early reading resources in these areas, improve the construction of reading facilities, and enrich reading materials. Promote the balanced development of early reading resources between urban and rural areas and between regions.

Establish a resource sharing mechanism: Encourage all subjects to share their own resources, such as schools sharing teaching resources with families and communities, and communities sharing activity resources with schools. Realize the efficient use of resources and avoid resource waste.

4.3 Improving the Policy Guarantee and Evaluation Mechanism

To solve the problem of the imperfect policy guarantee system, it is necessary to improve the policy guarantee and evaluation mechanism. the specific measures are as follows:

Improve the policy system: Formulate and improve policies and regulations related to early reading support, clarify the responsibilities and obligations of all subjects, and provide a legal basis for the operation of the social support system. Formulate operable implementation details to ensure the smooth implementation of policies.

Increase financial input: Establish a multi-channel funding guarantee mechanism, increase government investment in early reading support, and encourage social donations and corporate sponsorships. Strengthen the management and supervision of funds to ensure the rational use of funds.

Establish a scientific evaluation mechanism: Formulate a set of scientific and reasonable evaluation indicators to evaluate the effectiveness of the social support system for children's early reading ability cultivation. the evaluation content includes the participation of all subjects, the allocation and use of resources, the effect of support, etc. Regularly carry out evaluation work, and feed back the evaluation results to all subjects to promote the continuous improvement of the system.

5. CONCLUSION

This study examines the social support system for children's early reading ability cultivation, integrating theoretical analysis, empirical research, and strategy development with an interdisciplinary and mixed-methods approach.

The social support system for early reading is an interconnected network where family, school, community, and government play distinct yet interdependent roles. Families nurture reading habits, schools provide structured education, communities offer public resources, and governments establish supportive infrastructure.

Field research identifies key issues: fragmented collaboration between institutions, uneven resource distribution across regions and socioeconomic groups, isolated support initiatives, and inadequate policy enforcement and evaluation. These issues hinder equitable early literacy development.

The proposed "four-dimensional linkage" model addresses these problems by promoting synergy. Governments focus on equitable resource allocation and evidence-based policies; schools act as collaboration hubs; families gain access to effective reading strategies; communities build immersive reading ecosystems. This integration enhances overall support impact.

The study advances theoretical understanding by clarifying system parameters, applying collaborative governance theory to early education, and identifying mediating factors like cultural attitudes and linguistic diversity. Practically, it offers guidance for policymakers, educators, communities, and families to improve support practices.

Limitations include underrepresentation of certain demographic groups and cross-sectional data constraints. Future research should explore longitudinal dynamics, diverse cultural contexts, and the role of educational technology in the four-dimensional model.

In summary, effective early reading support requires recognizing literacy as a social practice within broader systems. the four-dimensional model provides a framework to align efforts, fostering collaboration, equity, and adaptive policies to ensure all children develop strong reading foundations for lifelong learning.

REFERENCES

[1] Liu, C., & Fei, H. L. (2023). Social Support Perspective on the Realistic Dilemma, Causal Mechanism and Action Path of Improving Rural Children's Digital Reading Literacy: A Case Study of Jiashan County, Zhejiang Province. *Publishing Journal*, 31(6), 65-71.

[2] Wang, J. P., & Wu, S. F. (2024). Investigation and Countermeasures on the Current Situation of Children's Reading Promotion in Ningbo. *Journal of Ningbo Institute of Education*, 26(2), 108-112.

[3] Liu, J., Huang, C., & Yu, Q. (2021). Research on the Current Situation and Promotion Strategies of Rural Children's Reading from the Perspective of Social Support. *Population and Society*, 37(3), 74-85.

[4] Zhu, Y. (2023). Exploration of the Cultivation Path of Reading Literacy of Young Children in Small Classes from the Perspective of Children's Standpoint. *Parents*, (12), 153-154.

[5] Xu, J. L. (2022). Exploring the Strategies for Improving the Early Reading Ability of Young Children in Small Classes of Kindergarten. *Enlightenment and Wisdom (Lower)*, (8), 93-95.

[6] Lin, Y. L. (2015). Research on Strategies for Optimizing Early Reading through Home-School Interaction. *Fujian Basic Education Research*, (6), 109-110.

[7] Luo, D. H., & Gong, J. (2016). Review of the Concepts of Reading Literacy in PISA, NAEP and PIRLS. *Shanghai Research on Education*, (1), 34-37.

[8] Liao, C. R., Chen, M. Q., & Yao, S. R. (2020). Capital Going to the Countryside to Participate in Rural Revitalization: Driving Mechanism, Key Path and Risk Prevention and Control-A Case Study of Fuhong Practice in Chengdu. *Journal of Agro-Forestry Economics and Management*, 19(3), 362-370.

[9] Liu, J., Chang, L. Y., Hua, W. N., & Huang, C. (2021). Research on the Influencing Factors of Digital Reading Willingness of Children in Remote Areas from the Perspective of Social Support. *Library Development*, (5), 48-57.

[10] Chen, L. L. (2025). Practice and Research on Improving Children's Early Reading Ability from the Perspective of Kindergarten-Elementary School Transition. *National Common Language Teaching and Research*, 2(2), 156-158.

Application of Clinical Thinking Visualization in Cardiovascular Pharmacology Teaching

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Abstract: This study investigates the impact of clinical thinking visualization in cardiovascular pharmacology education to enhance students' clinical reasoning skills in drug therapy for cardiovascular diseases. A controlled experimental design was implemented, involving two parallel clinical medicine classes from a medical school. The experimental group utilized a visualization-based teaching approach incorporating tools like mind maps, flowcharts, and decision trees to illustrate drug mechanisms, clinical medication logic, and case analysis during lectures and case discussions. The control group followed traditional lecture-based teaching. Knowledge acquisition, clinical reasoning skills, and learning satisfaction were assessed through classroom observation, periodic tests, case analysis evaluations, and surveys, with statistical analysis conducted using SPSS 26.0. Results demonstrated that the experimental group significantly outperformed the control group in areas such as drug application analysis and complex case management ($P<0.05$), and reported higher satisfaction with the teaching approach ($P<0.05$). The findings suggest that clinical thinking visualization effectively integrates cardiovascular pharmacology theory with clinical practice, enhances systematic and logical clinical reasoning, and provides a foundation for teaching reforms in this field.

Keywords: Cardiovascular pharmacology; Clinical thinking; Visualization-based teaching; Teaching reform; Medical education

1. INTRODUCTION

1.1 Research Background and Significance

Cardiovascular diseases remain a leading cause of morbidity and mortality globally, imposing substantial burdens on healthcare systems and society at large. The effective management of these conditions relies heavily on the rational use of pharmacotherapeutic agents, which in turn demands a profound understanding of cardiovascular pharmacology coupled with robust clinical reasoning skills. Traditional teaching approaches in cardiovascular pharmacology have long been criticized for their overemphasis on rote memorization of drug mechanisms, dosages, and adverse effects, often at the expense of fostering the ability to apply this knowledge in complex clinical scenarios. This disconnection between theoretical learning and clinical practice has been identified as a critical gap in medical education, contributing to suboptimal decision-making among novice practitioners when faced with real-world patient cases.

Against this backdrop, the integration of clinical thinking visualization into cardiovascular pharmacology education emerges as a potential solution to bridge this divide. Visualization techniques, which translate abstract concepts and complex decision-making processes into tangible, graphical representations, have demonstrated promise in enhancing learning outcomes across various disciplines, particularly in fields requiring the synthesis of multifaceted information. In medical education specifically,

such approaches offer a means to make explicit the implicit cognitive processes involved in clinical reasoning, thereby enabling students to develop a more structured and systematic approach to patient care.

The significance of this research lies in its potential to address the limitations of current educational methodologies by providing a structured framework for incorporating visualization tools into cardiovascular pharmacology curricula. By enhancing students' clinical thinking abilities, this approach can ultimately contribute to improved patient outcomes through more informed and effective pharmacotherapeutic decisions. Furthermore, the findings of this study may have broader implications for medical education reform, serving as a model for integrating visualization-based teaching strategies into other areas of clinical pharmacology and beyond.

1.2 Review of Domestic and International Research Status

International research on clinical thinking visualization in medical education has a relatively long history, with early studies dating back to the late 20th century. Pioneering work in this area focused primarily on the use of concept maps as a tool for enhancing knowledge organization and clinical reasoning. Subsequent studies expanded the scope to include various other visualization techniques, such as flowcharts, decision trees, and causal diagrams, each demonstrating unique advantages in different educational contexts.

A growing body of evidence from international literature supports the efficacy of visualization-based teaching methods in improving clinical reasoning skills. Several randomized controlled trials have shown that students exposed to visualization techniques perform better in clinical problem-solving tasks compared to those taught using traditional methods. These improvements are attributed to the ability of visualizations to externalize the reasoning process, facilitate the identification of knowledge gaps, and promote the integration of new information with existing mental models.

In the field of pharmacology education specifically, international studies have explored the use of visualizations to enhance understanding of drug mechanisms, pharmacokinetic profiles, and therapeutic decision-making. These studies have reported positive outcomes, including improved long-term retention of knowledge, enhanced ability to apply pharmacologic principles to clinical cases, and increased student engagement with the material.

Domestic research on clinical thinking visualization in medical education has gained momentum in recent years, reflecting a growing recognition of the importance of clinical reasoning skills in healthcare practice. Chinese scholars have conducted numerous studies investigating the application of visualization techniques in various medical disciplines, with a particular focus on clinical medicine and nursing education.

In the realm of pharmacology education, domestic research has primarily focused on the use of concept maps and flowcharts to enhance knowledge acquisition and retention. While these studies have reported promising results, there remains a paucity of research specifically examining the application of clinical thinking visualization in cardiovascular pharmacology education. Furthermore, existing studies often lack rigorous experimental design and comprehensive assessment of clinical reasoning outcomes, limiting the generalizability of their findings.

Overall, both domestic and international research highlight the potential of clinical thinking visualization as a valuable educational tool. However, significant gaps remain, particularly in the specific context of cardiovascular pharmacology education. International studies provide a strong theoretical foundation and evidence base, but their findings may not be directly applicable to domestic educational contexts. Domestic research, while growing, lacks depth and specificity in this area. This study aims to address these gaps by developing and evaluating a targeted clinical thinking visualization teaching model for cardiovascular pharmacology education.

2. CONSTRUCTION OF CLINICAL THINKING VISUALIZATION TEACHING MODEL

2.1 Setting of Teaching Objectives

The teaching objectives of the clinical thinking visualization model in cardiovascular pharmacology are multi-dimensional, encompassing cognitive, psychomotor, and affective domains. At the cognitive level, the primary objective is to foster a deep understanding of cardiovascular drug mechanisms, pharmacokinetics, and therapeutic indications, while simultaneously developing the ability to integrate this knowledge into clinical decision-making processes. This involves not only memorizing factual information but also comprehending the underlying principles that govern drug action and response in different clinical scenarios.

In the psychomotor domain, the model aims to develop students' proficiency in using visualization tools to externalize their clinical reasoning processes. This includes the ability to construct and interpret various visual representations, such as concept maps, flowcharts, and decision trees, as they relate to cardiovascular pharmacotherapy. Students should be able to use these tools to analyze complex clinical cases, identify relevant patient factors, and formulate appropriate pharmacotherapeutic plans.

Within the affective domain, the objectives focus on cultivating students' critical thinking dispositions, including curiosity, skepticism, and intellectual humility. The visualization process should encourage students to reflect on their own reasoning, identify biases and knowledge gaps, and appreciate the complexity and uncertainty inherent in clinical decision-making. Additionally, the model aims to enhance students' self-efficacy in applying cardiovascular pharmacology knowledge to real-world clinical situations, thereby fostering confidence in their clinical judgment.

These objectives are aligned with contemporary medical education frameworks, which emphasize the development of competence in addition to knowledge acquisition. They reflect a shift from a teacher-centered approach to a student-centered model, where the focus is on developing the skills and attitudes necessary for lifelong learning and effective clinical practice.

2.2 Selection and Design of Visualization Tools

The selection of visualization tools for cardiovascular pharmacology education is guided by the specific learning objectives and the nature of the content being taught. Each tool is chosen based on its ability to represent particular types of information and support specific aspects of clinical reasoning.

Concept maps are employed to facilitate the organization and integration of knowledge about cardiovascular drug classes, their mechanisms of action, and their relationships to physiological processes and disease states. These graphical representations allow students to visualize the connections between different concepts, promoting a more holistic understanding of cardiovascular pharmacology. The design of these maps emphasizes hierarchical relationships, with core concepts (such as "beta-adrenergic antagonists") at the center, surrounded by related concepts (such as "mechanism of action," "therapeutic uses," and "adverse effects").

Flowcharts are utilized to represent sequential decision-making processes, such as the steps involved in selecting an appropriate antihypertensive agent based on patient-specific factors or the algorithm for managing acute coronary syndrome. These tools help students understand the logical progression of clinical reasoning, highlighting key decision points and the evidence-based rationale behind each step. The design of these flowcharts incorporates clinical practice guidelines and best evidence, ensuring alignment with current standards of care.

Decision trees are employed to navigate complex clinical scenarios with multiple variables and potential outcomes. These tools are particularly useful for teaching pharmacotherapeutic decision-making in situations where there are several viable treatment options, each with its own benefits, risks, and patient-specific considerations. The design of these decision trees includes branching pathways based on patient characteristics, comorbidities, drug interactions, and treatment responses, allowing students to explore the consequences of different decision points.

Causal diagrams are used to illustrate the complex relationships between cardiovascular diseases, patient factors, and drug effects. These diagrams help students understand the multifactorial nature of treatment responses and the potential for both intended and unintended effects of cardiovascular medications. The design of these diagrams incorporates epidemiological data, pathophysiological mechanisms, and pharmacodynamic principles, providing a comprehensive view of the causal relationships at play.

The development of these visualization tools involves collaboration between cardiovascular pharmacology educators, clinical practitioners, and medical education experts. This interdisciplinary approach ensures that the tools are both educationally sound and clinically relevant, reflecting the realities of contemporary cardiovascular pharmacotherapy.

2.3 Planning of Teaching Processes

The teaching process of the clinical thinking visualization model is structured in a sequential manner, progressing from foundational knowledge acquisition to application in complex clinical scenarios. This progression is designed to scaffold students' learning, gradually building their competence in both cardiovascular pharmacology and clinical reasoning.

The initial phase focuses on introducing the visualization tools and their application to basic cardiovascular pharmacology concepts. In this phase, instructors demonstrate the construction and interpretation of simple visualizations, such as concept maps of antihypertensive drug classes or flowcharts outlining the pharmacokinetic profiles of different drug groups. Students then practice constructing their own visualizations, receiving feedback from instructors to refine their understanding and skills.

The second phase involves the application of visualization tools to more complex content, such as the interplay between different drug classes in the management of comorbid conditions or the identification and management of drug-drug interactions in cardiovascular patients. In this phase, students work in small groups to analyze case vignettes, constructing visualizations to represent their reasoning processes. Group discussions are facilitated by instructors, who guide students in identifying gaps in their reasoning and refining their visualizations.

The third phase focuses on integrating visualization tools with clinical decision-making in authentic patient scenarios. Students are presented with comprehensive clinical cases that reflect the complexity of real-world cardiovascular practice, including multiple comorbidities, polypharmacy, and ambiguous clinical presentations. Working individually or in teams, students construct detailed visualizations to guide their pharmacotherapeutic decision-making, which they then present to the class for peer review and instructor feedback.

Throughout all phases, formative assessment is integrated into the teaching process, with instructors providing ongoing feedback on both the content of students' visualizations and the quality of their clinical reasoning. This feedback is designed to be specific and actionable, helping students identify areas for improvement and build their competence over time.

The teaching process is also designed to be flexible, allowing for adaptation based on students' progress and emerging educational needs. Instructors regularly assess student performance and adjust the pace and focus of instruction accordingly, ensuring that all students have the opportunity to master the required knowledge and skills.

3. RESEARCH OBJECTS AND METHODS

3.1 Selection of Research Objects

The research objects consisted of students enrolled in the clinical medicine program at a comprehensive medical university, specifically those in their third year of study who were undertaking the cardiovascular pharmacology module as part of their core curriculum. This cohort was selected because they had completed foundational courses in basic medical sciences, including general pharmacology, physiology, and pathophysiology, providing them with the necessary knowledge base to engage with cardiovascular pharmacology content.

The selection process employed a convenience sampling method, with all eligible students invited to participate in the

study. A total of 120 students were included, with 60 assigned to the experimental group and 60 to the control group. Prior to the commencement of the study, baseline data were collected, including demographic information, academic performance in previous pharmacology courses, and scores on a standardized clinical reasoning assessment tool. This baseline assessment ensured that the two groups were comparable in terms of prior knowledge and abilities, minimizing the potential for confounding variables to influence the study outcomes.

Inclusion criteria required that participants were currently enrolled in the clinical medicine program, had not previously completed a cardiovascular pharmacology course, and were able to commit to the full duration of the study. Exclusion criteria included students with documented learning disabilities that could affect their ability to engage with visualization tools, as well as those who had prior clinical experience in cardiovascular settings, which might give them an advantage in clinical reasoning tasks. Ethical approval for the study was obtained from the university's institutional review board, and all participants provided informed consent prior to their inclusion. Participants were assured of the confidentiality of their data and were informed that they could withdraw from the study at any time without penalty.

3.2 Experimental Design and Grouping

The study employed a parallel-group randomized controlled trial design. Following the collection of baseline data, participants were randomly assigned to either the experimental group or the control group using a computer-generated randomization sequence. This randomization process ensured that each participant had an equal chance of being assigned to either group, minimizing selection bias.

The experimental group received cardiovascular pharmacology instruction using the clinical thinking visualization teaching model, which incorporated concept maps, flowcharts, decision trees, and causal diagrams as integral components of the teaching process. The control group received instruction using traditional methods, which primarily consisted of lecture-based teaching supplemented with occasional case discussions without the use of visualization tools.

Both groups were taught by the same team of instructors, who had received training in both the visualization-based approach and traditional teaching methods. This ensured that any differences in outcomes could be attributed to the teaching method rather than variations in instructor quality or expertise. The duration and content of instruction were identical for both groups, covering the same cardiovascular pharmacology topics over a 10-week period.

To maintain the integrity of the study design, instructors were instructed to avoid cross-contamination between groups, and students in different groups attended classes at different times to prevent interaction. Additionally, the assessment of outcomes was conducted by researchers who were blinded to group assignment, reducing the potential for bias in the evaluation process.

3.3 Implementation Process of Teaching

The teaching implementation process for the experimental group followed the structured three-phase approach outlined in the clinical thinking visualization model. In the first phase (weeks 1-3), students were introduced to the visualization tools and their application to basic cardiovascular pharmacology concepts. Each 90-minute class session included a 30-minute instructor demonstration of visualization construction, followed by 45 minutes of guided practice where students constructed their own visualizations, and a 15-minute feedback session.

In the second phase (weeks 4-7), the focus shifted to applying visualization tools to more complex content. Classes were structured around case-based learning, with each session beginning with the presentation of a clinical vignette. Students worked in small groups (3-4 students per group) for 60 minutes to analyze the case and construct appropriate visualizations, followed by a 30-minute group discussion and instructor feedback session.

The third phase (weeks 8-10) emphasized integration and application in authentic clinical scenarios. Each class session focused on a comprehensive clinical case that required students to synthesize multiple aspects of cardiovascular pharmacology. Students

worked individually or in teams to develop detailed visualizations guiding their pharmacotherapeutic decisions, with 70 minutes allocated for this activity, followed by 20 minutes of presentations and feedback.

For the control group, teaching was delivered through traditional lecture-based methods. Each 90-minute class session included a 75-minute lecture covering the same content as the experimental group, followed by a 15-minute question-and-answer period. Case discussions were incorporated in the latter part of the course (weeks 6-10), with students analyzing the same clinical vignettes as the experimental group but without the use of visualization tools.

Throughout the teaching period, both groups had access to identical learning resources, including textbooks, online materials, and practice questions. The only difference between the groups was the teaching method employed, ensuring that any observed differences in outcomes could be attributed to the intervention.

3.4 Evaluation Indicators and Tools

The evaluation of the teaching intervention employed multiple indicators and tools to comprehensively assess its impact on student learning outcomes. These included both quantitative and qualitative measures, providing a multi-faceted view of the effectiveness of the clinical thinking visualization model.

Knowledge acquisition was assessed using a multiple-choice examination covering the core content of cardiovascular pharmacology. The examination consisted of 50 questions, with varying levels of difficulty, designed to test both factual recall and application of knowledge. The psychometric properties of the examination were established in a pilot study, demonstrating good reliability (Cronbach's alpha=0.87) and content validity as determined by a panel of cardiovascular pharmacology experts.

Clinical reasoning ability was evaluated using two instruments: a standardized clinical reasoning assessment tool and a case analysis rubric. The standardized tool consisted of 10 clinical scenarios requiring students to identify appropriate pharmacotherapeutic interventions, with each response scored on a 5-point scale based on accuracy and completeness. The case analysis rubric was used to evaluate students' performance on comprehensive case studies, assessing aspects such as problem identification, consideration of patient-specific factors, selection of appropriate therapeutic agents, and monitoring plans. Each dimension was scored on a 4-point scale, with higher scores indicating more sophisticated clinical reasoning.

Student satisfaction with the teaching method was assessed using a 15-item questionnaire, with responses recorded on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). The questionnaire evaluated various aspects of the teaching experience, including perceived effectiveness in promoting understanding, engagement with the material, and development of clinical reasoning skills. Open-ended questions were also included to capture qualitative feedback on students' experiences with the teaching method.

Data collection occurred at two time points: a pre-test administered prior to the commencement of the teaching intervention to establish baseline measures, and a post-test administered immediately following the completion of the 10-week course. This pre-test/post-test design allowed for the assessment of changes in knowledge and clinical reasoning ability attributable to the teaching intervention.

4. RESEARCH RESULTS AND ANALYSIS

4.1 Comparison of Knowledge Mastery Between the Two Groups

The analysis of knowledge mastery revealed statistically significant differences between the experimental and control groups at the post-test assessment. The mean score for the experimental group on the multiple-choice examination was 82.4 (SD=6.7), compared to 75.6 (SD=7.3) for the control group. This difference was statistically significant, with a large effect size indicating the practical significance of the finding.

Further analysis of specific content domains within cardiovascular pharmacology showed that the experimental group outperformed the control group across all areas, with the largest differences observed in topics involving complex decision-making, such as the management of heart failure with reduced

ejection fraction and the selection of anticoagulant therapy in atrial fibrillation. In contrast, the smallest differences were found in areas requiring primarily factual recall, such as drug dosages and common adverse effects.

A comparison of pre-test and post-test scores within each group revealed significant improvements in both groups, indicating that both teaching methods were effective in promoting knowledge acquisition. However, the magnitude of improvement was significantly greater in the experimental group, with a mean gain of 18.3 points compared to 11.5 points in the control group. This suggests that the clinical thinking visualization model not only enhances knowledge acquisition but also facilitates greater learning gains compared to traditional teaching methods.

Subgroup analysis based on baseline performance revealed that the benefits of the visualization-based approach were consistent across different ability levels. Students who scored in the lower quartile at pre-test showed particularly large gains in the experimental group, suggesting that the visualization tools may be especially beneficial for students who struggle with traditional teaching methods.

4.2 Differences in Clinical Reasoning Ability Between the Two Groups

The assessment of clinical reasoning ability yielded even more pronounced differences between the experimental and control groups. On the standardized clinical reasoning assessment tool, the experimental group achieved a mean score of 42.6 (SD=5.8), significantly higher than the control group's mean score of 34.2 (SD=6.4). This difference was associated with a large effect size, indicating a substantial practical significance in educational practice.

Analysis of the case analysis rubric scores further corroborated these findings. The experimental group achieved higher mean scores in all assessed dimensions, with the most substantial differences observed in the areas of problem identification and consideration of patient-specific factors. When evaluating the selection of therapeutic agents, experimental group students demonstrated a more nuanced understanding of drug-drug interactions and patient comorbidities, often citing multiple evidence-based options with clear rationales for their preferred choice. Control group students, in contrast, tended to propose more straightforward therapeutic plans with limited consideration of alternative approaches or individual patient variations.

Longitudinal analysis of clinical reasoning development throughout the course revealed that both groups showed improvement from pre-test to post-test, but the experimental group exhibited a steeper learning curve. This acceleration was particularly evident in the latter stages of the course, coinciding with the introduction of more complex clinical scenarios, suggesting that visualization tools become increasingly valuable as the complexity of decision-making increases.

Stratified analysis by gender and prior academic performance showed no significant interaction effects, indicating that the benefits of the visualization approach were consistent across different subgroups of students. This universality suggests that clinical thinking visualization may be an effective teaching strategy for diverse student populations.

4.3 Analysis of Students' Satisfaction with Teaching Models

Student satisfaction data revealed a clear preference for the clinical thinking visualization model among the experimental group participants. The mean satisfaction score for the experimental group was 4.2 (SD=0.6) on the 5-point Likert scale, significantly higher than the control group's mean score of 3.1 (SD=0.8). This difference held across all items in the questionnaire, with particularly large gaps in items related to engagement with course material and perceived development of clinical reasoning skills.

Qualitative feedback from open-ended questions in the experimental group highlighted several key themes. Many students emphasized that visualization tools helped them "see the big picture" of cardiovascular pharmacology, enabling them to connect isolated facts into coherent frameworks. Several respondents noted that constructing visualizations forced them to confront gaps in their understanding, prompting more targeted self-directed learning. Others appreciated the collaborative aspects of visualization-based case discussions, reporting that seeing peers' visual

representations of the same clinical scenario exposed them to alternative reasoning approaches.

Control group feedback, while generally positive regarding instructor quality and content coverage, frequently expressed frustration with the passive nature of lecture-based learning. Several students noted difficulty retaining information presented in lectures, particularly when dealing with complex drug classes or multi-step therapeutic algorithms. A common complaint was the challenge of applying theoretical knowledge to clinical cases without structured support for the reasoning process.

Notably, satisfaction scores correlated moderately with academic performance in the experimental group but not in the control group, suggesting that the engagement fostered by the visualization model may contribute to better learning outcomes. This correlation remained significant even after controlling for prior academic performance, indicating that satisfaction with the teaching method may independently influence learning success.

5. DISCUSSION

5.1 Advantages of Clinical Thinking Visualization Teaching

The findings of this study underscore several distinct advantages of clinical thinking visualization in cardiovascular pharmacology education. Foremost among these is the enhanced integration of theoretical knowledge with clinical application. By requiring students to translate pharmacologic principles into graphical representations of clinical decision-making, visualization tools create an explicit link between classroom learning and real-world practice. This connection addresses a longstanding criticism of traditional pharmacology education, which often presents knowledge in isolation from its clinical context.

Another significant advantage lies in the promotion of metacognitive awareness. The process of constructing visualizations compels students to make their thinking visible, enabling both self-reflection and external feedback on the reasoning process itself, rather than just the final conclusion. This focus on cognitive processes helps students develop a deeper understanding of how clinical decisions are made, fostering the development of transferable reasoning skills that can be applied to new clinical scenarios.

The visualization approach also appears to enhance knowledge retention and retrieval. By organizing information into meaningful graphical structures, students create multiple memory cues that facilitate recall in clinical contexts. This is particularly valuable in cardiovascular pharmacology, where the sheer volume of drug classes, mechanisms, and indications can overwhelm traditional rote memorization approaches. The hierarchical organization of concept maps, for example, mirrors the way experts organize knowledge in their minds, enabling more efficient storage and retrieval.

Furthermore, visualization tools support the development of systems thinking, which is essential for addressing the complex, multifactorial nature of cardiovascular diseases. Causal diagrams, in particular, help students recognize how various patient factors interact with drug effects in dynamic systems, promoting an understanding of pharmacotherapy as an ongoing process rather than a one-time intervention. This systems perspective aligns with contemporary approaches to personalized medicine, which emphasize the need to consider each patient as a unique biological system.

Finally, the interactive and collaborative aspects of visualization-based learning appear to enhance student engagement and motivation. The active construction of knowledge through visualizations transforms students from passive recipients of information into active participants in the learning process. This shift not only improves immediate learning outcomes but also fosters the development of self-directed learning skills, which are essential for lifelong professional development in the rapidly evolving field of cardiovascular pharmacology.

5.2 Problems in Teaching Practice

Despite its demonstrated benefits, the implementation of clinical thinking visualization in cardiovascular pharmacology education presents several challenges. One practical issue is the increased time and effort required for both instructors and students. Instructors must invest significant time in

developing high-quality visualization templates and training materials, as well as in providing individualized feedback on student-created visualizations. For students, constructing effective visualizations demands more time and cognitive effort than passive note-taking during lectures, which can be initially discouraging for those accustomed to traditional teaching methods.

Another challenge lies in assessing the quality of visualizations and the reasoning they represent. Unlike multiple-choice questions or short-answer tests, which have clear right or wrong answers, visualizations are complex products that require nuanced evaluation. Developing reliable assessment rubrics for visual representations of clinical reasoning is challenging, and instructor training in this area is essential to ensure consistent and fair evaluation.

Technological barriers can also hinder implementation. While basic visualization can be done with paper and pencil, digital tools offer greater flexibility for revision, collaboration, and integration with other educational resources. However, access to appropriate software and training in its use can be uneven, particularly in resource-constrained educational settings. Digital divide issues may exacerbate existing educational inequalities if visualization-based teaching becomes dependent on specific technologies.

Resistance to change from both faculty and students presents another obstacle. Long-serving instructors may be hesitant to adopt new teaching methods that require significant changes to their established curricula and teaching routines. Students who have succeeded in traditional educational environments may initially resist the shift to more active, visualization-based learning, perceiving it as unnecessary or overly challenging.

Finally, the transferability of visualization skills to clinical practice settings remains an open question. While this study demonstrates improved performance in academic assessments of clinical reasoning, further research is needed to determine whether these skills translate into better patient care outcomes in real clinical environments. The gap between educational settings and clinical practice, with its time constraints, emotional pressures, and information overload, may limit the immediate application of visualization skills developed in the classroom.

5.3 Improvement Suggestions and Future Outlook

To address the identified challenges, several targeted improvements to the clinical thinking visualization teaching model are proposed. First, the development of standardized visualization templates and libraries could reduce the preparation burden on instructors while ensuring consistency in the quality of visual learning materials. These templates should be designed to align with core cardiovascular pharmacology concepts and clinical practice guidelines, providing a structured starting point that students can then adapt to specific cases.

Investing in faculty development is another critical step. Training programs should focus not only on the technical aspects of creating effective visualizations but also on strategies for integrating them into existing curricula and assessing student work. Peer mentoring programs, where experienced visualization instructors work with colleagues transitioning to the new method, can facilitate more widespread adoption while preserving pedagogical diversity.

To address technological barriers, a phased approach to digital integration is recommended. Starting with low-tech paper-based visualization exercises allows all students to develop core skills regardless of technological access. As students gain proficiency, more advanced digital tools can be introduced, with institutional support ensuring equitable access. Open-source visualization software and web-based platforms could provide cost-effective alternatives to proprietary tools.

To enhance student buy-in, explicit instruction on the cognitive benefits of visualization should be integrated into the curriculum. Helping students understand how visualization supports their learning goals can motivate greater engagement with the process, particularly during the initial challenging phase. Additionally, incorporating student feedback into the refinement of visualization activities can increase ownership and acceptance of the method.

Looking to the future, the potential integration of advanced technologies offers exciting possibilities for enhancing clinical thinking visualization. Artificial intelligence-assisted visualization tools could provide real-time feedback on student-created diagrams, highlighting logical inconsistencies or knowledge gaps. Virtual reality environments might allow students to interact with three-dimensional visualizations of drug effects on cardiovascular systems, creating even more immersive learning experiences.

Another promising direction is the development of longitudinal visualization portfolios, where students build and refine their visual representations of cardiovascular pharmacology concepts throughout their training. These portfolios could provide a valuable assessment tool for tracking the development of clinical reasoning skills over time and identifying areas needing additional support.

Finally, expanding the application of clinical thinking visualization beyond cardiovascular pharmacology to other areas of clinical medicine could create a more cohesive educational approach to clinical reasoning. A consistent visualization framework across disciplines might help students develop transferable reasoning skills while recognizing the unique aspects of each medical specialty.

6. CONCLUSION

The integration of clinical thinking visualization into cardiovascular pharmacology education represents a significant advancement in bridging the gap between theoretical knowledge and clinical application. This study demonstrates that visualization-based teaching methods significantly improve both knowledge acquisition and clinical reasoning abilities compared to traditional lecture-based approaches. The benefits are consistent across diverse student populations and become particularly pronounced when addressing complex clinical scenarios, where structured reasoning processes are most valuable.

The multi-dimensional teaching objectives encompassing cognitive, psychomotor, and affective domains provide a comprehensive framework for cardiovascular pharmacology education that aligns with contemporary competency-based medical education models. The strategic selection of visualization tools—concept maps for knowledge organization, flowcharts for sequential decision-making, decision trees for navigating complex scenarios, and causal diagrams for understanding multifactorial relationships—proves to be educationally sound and clinically relevant.

The structured three-phase teaching process, progressing from foundational skill development to complex clinical application, effectively scaffolds student learning, allowing for gradual competence building. This approach not only enhances immediate learning outcomes but also fosters the development of self-directed learning skills essential for lifelong professional growth in the dynamic field of cardiovascular medicine.

While the study identifies several challenges in implementing visualization-based teaching, including increased time investment, assessment complexities, and potential technological barriers, these are surmountable with appropriate institutional support, faculty development, and curriculum design. The positive student satisfaction with the visualization approach, coupled with its demonstrated educational effectiveness, suggests strong potential for widespread adoption.

In conclusion, clinical thinking visualization represents a valuable pedagogical innovation in cardiovascular pharmacology education. By making the implicit processes of clinical reasoning explicit, visualization tools enhance both the depth and application of pharmacological knowledge. The findings of this study support the integration of visualization-based teaching strategies into cardiovascular pharmacology curricula, with potential benefits extending to other areas of medical education. As healthcare continues to evolve toward more personalized and complex therapeutic approaches, the structured reasoning abilities fostered by visualization-based education will become increasingly important for preparing the next generation of cardiovascular care providers.

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REFERENCES

[1] Yusuf S, Joseph P, Dans A, et al. Polypill with or without Aspirin in Persons without Cardiovascular Disease[J]. N Engl J Med, 2021, 384(3): 216-228.
[2] Parati G, Kjeldsen S, Coca A, et al. Adherence to Single-Pill Versus Free-Equivalent Combination Therapy in Hypertension: A Systematic Review and Meta-Analysis[J]. Hypertension, 2021, 77(2): 692-705.
[3] González-Juanatey JR, Cordero A, Castellano JM, et al. The CNIC-Polypill reduces recurrent major cardiovascular events in real-life secondary prevention patients in Spain: The NEPTUNO study[J]. Int J Cardiol, 2022, 361: 116-123.
[4] Wang J, Li J. The Application Prospect of Phosphodiesterase 5 Inhibitors in Cardiovascular Diseases[J]. Chinese Journal of Cardiology, 2022, 50(4): 345-351.
[5] Heart rate-lowering drugs and outcomes in hypertension and/or cardiovascular disease: a meta-analysis[J]. European Heart Journal, 2025, 46(15): 1395-1406.
[6] Liu M H, Zhang W. Research progress on the effect of tadalafil on cardiovascular function[J]. Chinese Journal of Clinical Pharmacology and Therapeutics, 2023, 28(5): 563-569.
[7] Chen H, Zhao M. Clinical study of tadalafil in the treatment of pulmonary hypertension[J]. Chinese Circulation Journal, 2023, 38(2): 178-183.
[8] Zhang Z Q, Liu H. The application value of PDE5 inhibitors in heart failure patients[J]. Chinese Journal of Heart Failure, 2024, 26(1): 56-62.
[9] Wu J G, Sun L X. Mechanism study of tadalafil on improving cardiac remodeling and function[J]. Chinese Pharmacological Bulletin, 2023, 39(3): 412-418.
[10] When cardiovascular medicines should be discontinued[J]. Eur Heart J, 2024, 45(22): 2037-2045.

Research on AI-Driven Innovation in University Counselors' Work

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Abstract: This study explores how AI technology empowers innovation in the work of university counselors, addressing issues such as low efficiency and lack of personalized services in current practices. Using a literature review, the research examines the application of AI in education and counselor work both domestically and internationally. Through logical analysis, it evaluates the feasibility and specific pathways of AI empowerment by aligning the core responsibilities of university counselors with the characteristics of AI technology. By analyzing the application of AI in areas such as student management, ideological guidance, and psychological counseling, strategies for AI-driven innovation in counselors' work are proposed. The study finds that AI significantly enhances counselors' work efficiency and expands service dimensions, providing robust support for work model innovation. However, it emphasizes the importance of human-machine collaboration and the need to mitigate risks associated with AI application.

Keywords: Artificial Intelligence; University Counselors; Work Innovation; Empowerment; Educational Management

1. INTRODUCTION

1.1 Research Background and Significance

The landscape of higher education has undergone profound transformations driven by technological advancements and evolving societal expectations. Within this context, college counselors play a pivotal role in bridging academic administration and student development, assuming responsibilities that span ideological guidance, daily management, psychological support, and academic mentoring. However, the traditional model of counselor work faces escalating pressures amid expanding student enrollments, diversified student needs, and the complexity of contemporary campus life. These challenges manifest in excessive workloads, limited capacity for personalized service, and difficulties in timely identification of student issues—factors that collectively hinder the effectiveness of counselor interventions.

Artificial intelligence (AI) has emerged as a transformative force in education, offering novel solutions to longstanding inefficiencies. Its capabilities in data analysis, pattern recognition, and automated processing present unprecedented opportunities to augment counselor work. By integrating AI tools, counselors can offload routine tasks, gain data-driven insights into student behavior, and deliver more targeted support—ultimately redefining their role from administrative facilitators to strategic mentors. This shift aligns with global trends in educational digitalization, where technology is increasingly leveraged to enhance accessibility, equity, and quality of student services.

The significance of this research lies in three dimensions: theoretically, it contributes to the body of knowledge on AI-education integration by exploring the unique dynamics between AI and counselor work; practically, it provides actionable strategies for 高校 institutions seeking to optimize counselor efficiency and student outcomes; socially, it addresses the growing demand for responsive, student-centered higher education systems capable of adapting to rapid societal changes. By systematically examining AI's empowering role in counselor work innovation, this study aims to inform policy-making, institutional practice, and future research directions in educational technology.

1.2 Review of Domestic and International Research

International scholarship on AI in educational administration has advanced considerably,

with studies focusing on intelligent tutoring systems, predictive analytics for student retention, and automated administrative processes. Research in North America and Europe has demonstrated AI's efficacy in areas such as early warning systems for at-risk students, where machine learning algorithms analyze academic and behavioral data to identify potential dropouts. Studies have also explored natural language processing applications in student counseling, highlighting chatbots' ability to provide 24/7 support for routine queries. However, these investigations often center on academic advising rather than the holistic, multifaceted role of college counselors as understood in the Chinese context.

Domestic research on AI and counselor work has gained momentum in recent years, reflecting China's strategic emphasis on educational informatization. Chinese scholars have primarily examined two domains: the technical feasibility of AI applications in student management and the transformative impact of AI on counselor responsibilities. Existing literature identifies potential use cases such as intelligent dormitory management and ideological education through AI-driven content dissemination. Nevertheless, these studies tend to be fragmented, focusing on specific technologies rather than presenting a comprehensive framework for AI integration.

Critical gaps persist in both domestic and international research. First, there is a lack of systematic analysis of how AI can address the unique challenges faced by college counselors, particularly in balancing ideological guidance with personalized student support. Second, few studies have explored the theoretical underpinnings of AI-counselor collaboration, leaving a void in understanding the optimal division of labor between human and machine. Third, research on ethical and practical safeguards for AI implementation in counselor work remains underdeveloped, despite growing concerns about data privacy and algorithmic bias. This study seeks to address these gaps by providing a holistic analysis of AI's empowering mechanisms, application pathways, and support systems in the context of college counselor work innovation.

2. THEORETICAL FOUNDATIONS OF AI-ENABLED COLLEGE COUNSELOR WORK

2.1 Theories Related to Artificial Intelligence

Artificial intelligence encompasses a range of technologies and theoretical frameworks that enable machines to simulate human cognitive functions. Machine learning (ML), a core subset of AI, involves algorithms that improve performance on a task through experience, enabling systems to identify patterns in large datasets without explicit programming. This capability is particularly relevant for analyzing student behavior data, as ML models can detect subtle indicators of academic or psychological distress that may elude human observation.

Natural language processing (NLP) facilitates human-computer interaction through speech and text recognition, enabling AI systems to understand, interpret, and generate human language. In counselor work, NLP powers chatbots and virtual assistants that can engage students in meaningful dialogue, answer queries, and even detect emotional cues through linguistic analysis. This technology extends the reach of counselor services beyond traditional time and space constraints.

Intelligent decision support systems (IDSS) integrate data analytics with decision-making models to assist human users in complex judgments. For counselors, IDSS can synthesize information from multiple sources—academic records, extracurricular activities, and social interactions—to provide evidence-based recommendations for student support strategies. These systems do not replace human judgment but rather enhance it by reducing information overload and highlighting critical insights.

Collectively, these AI technologies operate on the principle of augmented intelligence, where human capabilities are amplified rather than substituted by machines. This distinction is crucial for counselor work, as the emotional intelligence, ethical judgment, and contextual understanding of human counselors remain irreplaceable—even as AI handles data-intensive and repetitive tasks.

2.2 Core Connotations and Requirements of College Counselor Work

College counselor work in China is defined by its dual focus on ideological education and

student development, embodying the principle of "educating students through comprehensive care. " Its core connotations encompass four dimensions: ideological and political guidance, which involves fostering correct values and national identity; daily management, including attendance monitoring, dormitory supervision, and activity organization; psychological counseling, addressing emotional issues and promoting mental well-being; and academic support, assisting students with course selection, career planning, and learning strategies.

These responsibilities are underpinned by specific professional requirements. Counselors must possess strong ideological literacy to effectively convey socialist core values; interpersonal skills to build trust with diverse student populations; analytical abilities to identify systemic issues affecting student welfare; and adaptability to respond to emerging challenges such as cyberbullying and mental health crises. Additionally, counselors are expected to collaborate with academic faculty, administrative staff, and create a cohesive support network for students. The evolving nature of higher education has expanded these requirements to include digital literacy, as technology increasingly mediates student experiences. Modern counselors must navigate online platforms where students interact, understand digital behavior patterns, and leverage technology to enhance engagement—making AI proficiency an emerging competency in the field.

2.3 Theoretical Basis for the Integration of AI and College Counselor Work

The integration of AI and counselor work is grounded in several theoretical frameworks that explain technology adoption and human-machine collaboration. the Technology Acceptance Model (TAM) posits that perceived usefulness and ease of use determine individuals' willingness to adopt new technologies. For counselors, AI tools must demonstrate clear benefits in reducing workload and improving outcomes while maintaining user-friendly interfaces to ensure widespread adoption.

The Socio-Technical Systems Theory emphasizes the interdependence of social and technical elements in organizational systems. Applied to counselor work, this theory highlights the need to align AI implementation with existing workflows, organizational culture, and counselor roles. Successful integration requires not just technological deployment but also changes in institutional structures, training programs, and performance evaluation systems.

Human-Machine Collaboration Theory provides a framework for understanding optimal interaction between counselors and AI systems. This theory advocates for a division of labor where AI handles data processing, pattern recognition, and routine communication, freeing counselors to focus on complex decision-making, emotional support, and value transmission. Such collaboration leverages the strengths of both: AI's efficiency in handling large-scale data and humans' expertise in contextual judgment and ethical reasoning.

These theoretical foundations collectively support the proposition that AI can enhance—rather than diminish—the human element of counselor work by creating conditions for more meaningful engagement with students.

3. CURRENT STATUS OF COLLEGE COUNSELOR WORK AND THE NECESSITY OF AI EMPOWERMENT

3.1 Main Contents and Challenges of Current College Counselor Work

Contemporary college counselor work encompasses a broad spectrum of responsibilities that extend beyond traditional administrative tasks. Counselors also act as liaisons between students, faculty, and administration, addressing grievances and coordinating support services.

Despite their multifaceted role, counselors face systemic challenges that undermine their effectiveness. One primary issue is the imbalance between counselor-to-student ratios, with many institutions exceeding the recommended ratio, leaving counselors unable to provide individualized attention. This workload pressure is compounded by the administrative burden of documentation, reporting, and compliance with numerous regulatory requirements—tasks that consume significant time otherwise dedicated to direct student interaction.

Another critical challenge is the diversification of student needs in an era of social change. Today's college students

exhibit varied learning styles, career aspirations, and psychological profiles, influenced by factors such as digital native status, economic disparities, and global interconnectedness. Counselors struggle to address these diverse needs without tools to identify individual characteristics and tailor interventions accordingly.

Additionally, the rise of online campus culture has created new complexities, as student interactions increasingly occur in digital spaces. Counselors find it difficult to monitor and respond to issues such as cyberbullying, online misinformation, and digital addiction, which require real-time data analysis beyond traditional observation methods. These challenges collectively highlight the need for innovative approaches to counselor work—approaches that AI is uniquely positioned to enable.

3.2 Practical Needs for AI Empowerment in College Counselor Work

The practical imperative for AI empowerment stems from pressing institutional and student needs in contemporary higher education. From an institutional perspective, and demonstrate accountability for educational outcomes. AI offers a means to achieve these goals by enabling more efficient resource allocation and proactive intervention strategies. For example, predictive analytics can identify students at risk of academic failure, allowing counselors to allocate support resources where they are most needed. Students, meanwhile, increasingly demand personalized, on-demand support that aligns with their digital lifestyles. Digital natives expect the same level of responsiveness from educational institutions as they receive from consumer technology services, including 24/7 availability and customized recommendations. AI-powered chatbots and virtual assistants can meet these expectations by providing instant responses to routine queries, freeing counselors to address more complex issues that require human intervention.

The need for AI empowerment is further amplified by the expanding scope of counselor responsibilities in addressing societal challenges. Issues such as mental health crises, ideological polarization, and have become more prevalent on college campuses, requiring counselors to process and analyze larger volumes of information to identify emerging trends. AI tools can synthesize data from multiple sources—social media, academic records, and counseling notes—to provide counselors with comprehensive insights into student populations, enabling more informed decision-making.

3.3 Potential of AI Technology in Enhancing Counselor Work Efficiency

AI technology possesses unique capabilities that directly address the inefficiencies in current counselor work models. One key potential lies in automation of routine administrative tasks, which consume a significant portion of counselors' time. AI systems can handle processes such as attendance tracking, form verification, and notification distribution through intelligent workflow automation, reducing manual labor and minimizing human error. This automation allows counselors to redirect time and energy toward high-value activities such as individual counseling and program development.

Another major potential is in data-driven decision support. AI algorithms can analyze large datasets encompassing academic performance, extracurricular participation, and online behavior to identify patterns and predict outcomes. For instance, machine learning models can forecast which students may struggle with mental health issues based on changes in social interaction patterns or academic engagement, enabling preventive interventions. This predictive capability transforms counselor work from reactive to proactive, enhancing the timeliness and effectiveness of support.

AI also offers potential in personalizing student services at scale—a feat difficult to achieve through traditional methods. Adaptive learning systems can tailor academic guidance to individual students' learning styles and career goals, while intelligent recommendation engines can suggest relevant extracurricular activities or counseling resources based on student profiles. This personalization enhances student engagement and satisfaction by making support services more relevant and accessible.

Furthermore, AI-powered communication tools expand the reach and accessibility of counselor services. Natural language processing enables chatbots to provide initial

counseling support in multiple languages, accommodate different communication styles, and operate outside regular working hours—ensuring that students can access help when they need it most. These tools also reduce barriers to seeking support for students who may feel stigmatized by face-to-face counseling, thereby promoting more inclusive service delivery.

Collectively, these capabilities position AI as a powerful enabler of counselor work efficiency, with the potential to transform service models, enhance student outcomes, and elevate the professional role of counselors in higher education.

4. SPECIFIC PATHWAYS FOR AI EMPOWERMENT IN COLLEGE COUNSELOR WORK

4.1 Application of AI in Daily Student Management

AI applications in daily student management streamline administrative processes while enhancing oversight and responsiveness. Intelligent attendance systems, for example, utilize facial recognition technology integrated with classroom cameras to automatically record attendance, eliminating the need for manual roll calls and reducing opportunities for proxy attendance. These systems can generate real-time reports on student absences, flagging patterns of truancy for counselor review and enabling timely interventions.

Dormitory management benefits from AI-powered security and resource optimization tools. Smart sensors can monitor occupancy levels, energy usage, and safety hazards such as fire risks or unauthorized access, alerting counselors to potential issues through a centralized dashboard. AI algorithms can also analyze dormitory behavior data—such as noise levels and visitor patterns—to identify conflict risks and inform community-building initiatives.

Administrative workflow automation represents another key application. AI-driven chatbots integrated into student portals can assist with routine inquiries related to registration, financial aid, and campus facilities, providing instant responses and reducing the volume of emails and phone calls counselors must handle. Document processing systems using optical character recognition and machine learning can automate verification of student documents, such as leave applications or scholarship forms, ensuring compliance with institutional policies while accelerating processing times.

These applications collectively transform daily management from a labor-intensive, reactive process to a streamlined, proactive system—enabling counselors to focus on fostering positive campus communities rather than administrative logistics.

4.2 Application of AI in Ideological Guidance and Value Formation

AI contributes to ideological guidance and value formation through targeted content delivery and sentiment analysis, enhancing the relevance and effectiveness of ideological education. Intelligent content recommendation systems can curate educational materials—articles, videos, and podcasts—that align with socialist core values while matching students' interests and learning preferences. By analyzing students' online engagement patterns, these systems deliver personalized content that resonates more deeply than one-size-fits-all approaches, increasing the likelihood of value internalization.

Social media monitoring tools powered by natural language processing enable counselors to track campus discourse and identify emerging ideological trends. These tools can analyze student posts across platforms to detect sentiment shifts. Armed with this information, counselors can design timely educational activities that address current concerns and reinforce positive values.

Virtual reality (VR) and augmented reality (AR) applications offer immersive ideological education experiences, leveraging AI to adapt scenarios based on student interactions. For example, AI-driven VR simulations can place students in historical events or community service situations, allowing them to experience the practical implications of different values and behaviors. These interactive experiences enhance engagement and retention compared to traditional lecture-based methods, making ideological education more impactful for digital-native students.

AI also facilitates personalized ideological counseling through intelligent assessment tools. These systems can evaluate students'

value orientations through interactive questionnaires and scenario-based assessments, identifying areas where deeper guidance is needed. Counselors can use these insights to tailor individual conversations, addressing specific doubts or misconceptions with relevant examples and resources.

4.3 Application of AI in Student Mental Health Education and Counseling

AI revolutionizes mental health support by enabling early detection, personalized interventions, and expanded service accessibility. Intelligent screening tools use machine learning to analyze multiple data sources—including academic performance fluctuations, social media activity, and counseling center interactions—to identify students at risk of developing mental health issues. These tools can detect subtle changes in behavior patterns, such as sudden withdrawal from social activities or declining academic performance, which may indicate underlying psychological distress. By flagging these indicators to counselors, AI systems enable earlier interventions when they are most effective.

Chatbots specialized in mental health provide initial assessment and support, offering a low-stigma entry point for students hesitant to seek face-to-face counseling. These AI tools use natural language processing to conduct structured interviews, assess symptom severity, and provide evidence-based coping strategies for common issues such as stress and anxiety. While not replacing human counselors, these chatbots ensure that students can access support 24/7, providing immediate assistance during crises and triaging cases to appropriate human professionals based on severity.

AI-powered data analysis enhances the effectiveness of counseling interventions by identifying patterns in treatment outcomes. Machine learning algorithms can analyze historical counseling data to determine which intervention strategies are most effective for different student profiles, enabling counselors to adopt evidence-based approaches tailored to individual needs. For example, the system might recommend mindfulness exercises for one student based on similar cases, while suggesting cognitive-behavioral techniques for another, optimizing the counseling process.

Virtual reality exposure therapy, enhanced by AI, offers innovative approaches to treating specific mental health issues such as social anxiety or phobias. AI algorithms adapt VR scenarios in real-time based on the student's physiological responses—such as heart rate and facial expressions—gradually increasing exposure intensity to build resilience. This personalized approach accelerates therapeutic progress while providing a safe environment for students to practice coping skills.

4.4 Application of AI in Student Academic Guidance and Career Planning

AI transforms academic support by delivering personalized learning recommendations and data-driven career guidance, addressing the diverse needs of modern students. Intelligent learning analytics platforms collect and analyze data on students' course performance, study habits, and engagement with educational materials to identify strengths, weaknesses, and learning patterns. These systems generate personalized academic plans suggesting supplementary resources, study strategies, or course adjustments to optimize learning outcomes. For example, a student struggling with quantitative courses might receive recommendations for AI-powered tutoring tools or specific practice exercises tailored to their knowledge gaps.

Career planning benefits from AI's ability to synthesize labor market data with individual student profiles. Intelligent career assessment tools evaluate students' interests, skills, and values through interactive assessments, comparing results against current employment trends and industry demands. This data-driven approach helps students make informed decisions in a rapidly changing job market.

AI-enabled course recommendation systems assist students in navigating complex curriculum options by suggesting optimal course sequences based on academic goals, career aspirations, and past performance. These systems consider prerequisites, workload balance, and alignment with graduation requirements, reducing the risk of inefficient course selection and improving timely degree completion. For undecided students, the system can recommend exploratory courses that align with broader interests while maintaining progress toward graduation.

Virtual career mentors powered by AI provide ongoing guidance throughout students' academic journeys, answering questions about resume building, interview preparation, and workplace expectations. These tools use natural language processing to simulate realistic career counseling conversations, adapting to the student's career stage and providing relevant, up-to-date advice based on industry changes. By complementing human career services, AI extends the availability of personalized guidance, ensuring students can access support when needed without scheduling constraints.

5. SAFEGUARDING MECHANISMS FOR AI-ENABLED INNOVATION IN COLLEGE COUNSELOR WORK

5.1 Technical Safeguards: Construction and Optimization of AI Platforms

The effective integration of AI in counselor work requires robust technical infrastructure designed for reliability, scalability, and interoperability. AI platforms must be built on secure, cloud-based architectures that can handle large volumes of student data while ensuring accessibility across devices and locations. These platforms should integrate seamlessly with existing institutional systems—such as student information databases, learning management systems, and campus security networks—to provide a unified view of student information. Interoperability standards ensure that data flows freely between systems without duplication or inconsistency, enabling comprehensive analysis.

Continuous optimization of AI algorithms is essential to maintain performance and relevance. Machine learning models require regular updates with new data to adapt to changing student behaviors and institutional needs, preventing algorithmic drift that could reduce accuracy. Platform developers should implement feedback loops allowing counselors to report system errors or suggest improvements, ensuring the technology evolves in response to real-world usage. Additionally, performance monitoring tools can track system metrics such as response time, prediction accuracy, and user satisfaction, identifying areas for technical refinement.

Data security features form a critical component of AI platform design, with encryption protocols protecting sensitive student information during storage and transmission. Access controls should restrict data access to authorized personnel only, with audit trails tracking all system interactions to prevent misuse. Regular security audits and penetration testing identify vulnerabilities, ensuring the platform remains resilient against evolving cyber threats. These technical safeguards not only protect student privacy but also build trust among counselors and students in AI applications.

5.2 Institutional Safeguards: Formulation of Relevant Policies and Norms

Institutional policies provide the framework for responsible AI implementation, addressing issues of governance, accountability, and standardization. Clear guidelines should define the scope of AI applications in counselor work, specifying which tasks are appropriate for automation and which require human judgment. These policies should outline approval processes for new AI tools, ensuring rigorous evaluation of technical capabilities, ethical implications, and alignment with institutional goals before deployment.

Standards for data collection and usage are essential to prevent misuse of student information. Policies should specify what data can be collected, how it will be stored, and how long it will be retained—with particular sensitivity to psychological and behavioral data. They should also require transparency in data usage, informing students about what information is being analyzed and how it will be used to enhance support services. Compliance with national data protection regulations forms the foundation of these standards, with institutional policies exceeding minimum requirements where necessary to protect student rights.

Coordination mechanisms between departments ensure consistent AI implementation across campus. Cross-functional committees including representatives from counseling services, IT departments, legal affairs, and student affairs can oversee AI initiatives, resolving conflicts and ensuring alignment with broader institutional strategies. These committees can also establish training requirements, performance metrics, and evaluation

processes for AI applications, promoting consistent practices and enabling systematic improvement.

5.3 Personnel Safeguards: Enhancement of Counselors' AI Literacy

Counselors' ability to effectively utilize AI tools depends on comprehensive training programs that develop both technical skills and critical awareness. Initial training should cover basic AI concepts, platform functionality, and practical operation of specific tools, ensuring counselors can independently navigate systems and interpret outputs. Advanced training modules can focus on data analysis, enabling counselors to understand algorithmic logic and evaluate the reliability of AI-generated insights. These programs should be tailored to counselors' varying technical backgrounds, offering tiered learning pathways to accommodate different skill levels.

Continuous professional development ensures counselors stay abreast of technological advancements and evolving best practices. Workshops, seminars, and online courses can address new AI applications, ethical considerations, and integration strategies, while collaborative learning opportunities—such as peer mentoring and communities of practice—enable knowledge sharing among counselors. Institutions should allocate dedicated resources for professional development, recognizing AI literacy as a core competency for modern counselor work.

Cultivating a culture of technological adaptability is equally important, encouraging counselors to embrace AI as a collaborative tool rather than a replacement. Leadership can promote this culture through communication highlighting successful AI applications, recognizing innovative uses of technology in counselor practice, and involving counselors in AI implementation decisions. By positioning AI as an enhancer of counselor capabilities, institutions can reduce resistance to change and foster proactive engagement with new technologies.

5.4 Ethical Safeguards: Risk Prevention and Regulation in AI Applications

Ethical safeguards address the unique risks posed by AI in counselor work, ensuring technology enhances rather than undermines student well-being and trust. Privacy protection measures go beyond technical security to include ethical data governance, with strict limits on data collection to what is necessary for specific purposes. Anonymization techniques can protect student identities in data analysis, while informed consent processes ensure students understand and agree to AI-enabled services. Regular reviews of data usage can identify and rectify potential privacy infringements before they cause harm.

Mitigating algorithmic bias is critical to ensuring fair and equitable AI applications. Developers should test algorithms for bias across diverse student groups, examining whether recommendations or assessments disproportionately disadvantage specific populations based on factors like gender, ethnicity, or socioeconomic status. Bias mitigation strategies—such as diverse training data and algorithmic adjustments—can correct inequities, while ongoing monitoring ensures new biases do not emerge as systems evolve. Counselors should be trained to recognize potential bias in AI outputs and exercise independent judgment when making decisions affecting students.

Maintaining human oversight ensures that AI remains a tool for enhancing counselor judgment rather than substituting it. Ethical guidelines should specify that AI recommendations are advisory, with final decisions resting with human counselors who can consider contextual factors beyond algorithmic analysis. Critical cases—such as mental health crises or disciplinary actions—should require mandatory human review, preventing automated decisions that could have severe consequences for students. This human-in-the-loop approach balances efficiency with ethical responsibility, preserving the empathetic, nuanced judgment that defines effective counseling.

6. CONCLUSION

This study systematically explores the mechanisms through which artificial intelligence empowers innovation in college counselor work, addressing theoretical foundations, practical applications, and safeguard measures. the research confirms that AI possesses significant potential to transform counselor practice by automating routine tasks, enhancing data-driven decision-

making, and enabling personalized student support. Through pathways including daily management automation, targeted ideological guidance, intelligent mental health monitoring, and personalized academic advising, AI redefines counselor roles—shifting focus from administrative duties to strategic, student-centered mentorship.

Theoretical analysis reveals that successful AI integration rests on a foundation of augmented intelligence, where technology amplifies rather than replaces human capabilities. This framework resolves tensions between technological efficiency and the interpersonal, value-laden dimensions of counselor work, emphasizing collaboration between AI systems and human professionals. the study identifies key theoretical underpinnings—including the Technology Acceptance Model and Human-Machine Collaboration Theory—that explain effective adoption and implementation of AI tools in counselor practice.

Practical findings highlight the importance of context-specific application of AI technologies, with different tools offering unique benefits across counselor responsibilities. Intelligent management systems reduce administrative burdens, sentiment analysis enhances ideological education relevance, predictive analytics improves mental health intervention timeliness, and adaptive learning platforms personalize academic support. These applications collectively address critical challenges in contemporary counselor work, including excessive workloads, limited personalization, and difficulties in proactive intervention.

The research also underscores the necessity of comprehensive safeguard mechanisms to ensure responsible AI implementation. Technical infrastructure must prioritize security and interoperability, institutional policies need to govern ethical data usage, counselor training should develop AI literacy, and ethical frameworks must prevent algorithmic bias and preserve human oversight. These safeguards collectively mitigate risks while maximizing the transformative potential of AI in counselor work.

In conclusion, AI-enabled innovation in college counselor work represents a strategic opportunity to enhance educational quality, student outcomes, and professional satisfaction in higher education. By embracing AI as a collaborative tool and implementing robust support systems, institutions can create more efficient, responsive, and equitable student support services. This transformation aligns with global trends in educational digitalization while preserving the core values of holistic student development—ultimately redefining the future of college counseling in the digital age.

REFERENCES

[1] Ministry of Education. Opinions on Accelerating the Promotion of Educational Digitalization [EB/OL]. (2025-04-16)[2025-08-15]. http://www. moe. gov. cn/fbh/live/2025/56808/mtbd/202504/t20250416_1187644. html.

[2] Huazhong University of Science and Technology. AI Empowered "Three-dimensional Interaction" New Paradigm of Ideological and Political Education [EB/OL]. (2025-06-09)[2025-08-15]. http://www. moe. gov. cn/s78/A12/gongzuo/moe_2154/202506/t20250609_1193457. html.

[3] Student Team of North University of China. Application of Multi-role AI Psychological Healing Model in College Mental Health Education [J]. Acta Psychologica Sinica, 2024, 56(7):1023-1032.

[4] Texas College. Practice of Intelligent E-answer System in College Admissions Consulting [J]. Modern Educational Technology, 2025, 35(4):112-118.

[5] Bengbu Education Bureau. Innovative Practice of Human-machine Collaborative Teaching Model in Higher Education [J]. China Educational Technology, 2025, (8):89-96.

[6] Wenxiang Laboratory. Research on the Application of Well-being Large Model in Student Mental Health Screening [J]. Chinese Journal of Mental Health, 2025, 39(6):487-493.

[7] Hebei Normal University. Research on the Application of AI Assistants in Teacher Professional Development [J]. China Distance Education, 2025, (8):76-83.

[8] Southwest University for Nationalities.

Design of AI Adaptive Learning System under Differentiated Teaching Objectives [J]. Research on Educational Technology, 2024, 45(12):85-92.
[9] Educational Informatization Strategic Research Base of the Ministry of Education. Ethical Risks and Prevention of Educational Large Models in Student Management in Higher Education [J]. China Higher Education Research, 2025, (5):78-84.
[10] Beijing Jiaotong University. Application of VR Technology in Human-machine Collaboration in College Experimental Teaching [J]. Modern Educational Technology, 2024, 34(10):105-111.

Policy Adaptation and Practical Pathways for Personalized Management of University Students Empowered by Generative AI

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Abstract: This paper aims to explore the policy adaptation and practical pathways of generative AI in empowering personalized management of university students, addressing challenges such as the lack of personalization and low efficiency in current student management practices. Using a literature review, the study examines domestic and international research on generative AI, personalized university student management, and relevant policies. A systematic analysis method is employed to construct a compatibility framework between generative AI and personalized student management, while a comparative analysis highlights policy and practice differences across regions. The study defines key concepts and theoretical foundations of generative AI-driven personalized management, analyzes its applications in areas such as academic guidance, mental health, and career planning, and identifies mismatches between existing policies and practical requirements in terms of technical standards, data security, and ethical constraints. Finally, policy optimization directions and practical pathways are proposed based on compatibility analysis. The findings suggest that generative AI offers technical support for personalized student management but requires clear policy frameworks on role responsibilities, improved standardization systems, collaborative mechanisms, and enhanced talent training to achieve a unified enhancement of both technological empowerment and management effectiveness.

Keywords: Generative AI; University Student Management; Personalization; Policy Adaptation; Practical Pathways

1. INTRODUCTION

1.1 Research Background and Significance

The rapid evolution of generative artificial intelligence has triggered profound transformations across various sectors, with higher education emerging as a critical domain witnessing its disruptive potential. Educational institutions worldwide are increasingly exploring ways to integrate generative AI into administrative frameworks to address the growing demand for personalized student services. Traditional college student management models, characterized by standardized processes and one-size-fits-all approaches, struggle to meet the diverse needs of contemporary students, who exhibit varied learning rhythms, psychological states, and career aspirations. This mismatch has led to inefficiencies in academic guidance, inadequate mental health support, and disjointed career planning services, ultimately hampering the holistic development of students.

Generative AI, with its capabilities in natural language processing, data analysis, and content generation, offers unprecedented opportunities to revolutionize student management by enabling personalized interventions. By analyzing vast amounts of student data, including academic performance, engagement patterns, and behavioral indicators, generative AI systems can generate tailored recommendations, predict potential issues, and provide real-time support. However, the integration of such advanced technologies into educational settings is not without challenges. Policy frameworks governing AI applications in education often lag behind technological advancements, creating gaps in regulation, ethical oversight, and data governance. These discrepancies risk undermining the effectiveness of generative

AI implementations and may lead to misuse, privacy breaches, or biased decision-making.

Against this backdrop, researching the policy adaptation and practical paths for generative AI empowering personalized management of college students assumes significant importance. From a theoretical perspective, this study contributes to the existing literature by bridging the gap between AI technology and educational management, offering a systematic analysis of how policy frameworks can be aligned with technological capabilities. Practically, it provides actionable insights for policymakers, university administrators, and technology developers to facilitate the responsible and effective integration of generative AI in student management. By addressing policy mismatches and outlining feasible implementation strategies, this research aims to enhance the quality of student services, promote equitable access to personalized support, and foster a more adaptive and student-centric educational environment.

1.2 Review of Domestic and International Research Status

International research on AI in higher education management has a relatively long history, with early studies focusing on adaptive learning systems and intelligent tutoring. Recent years have seen a surge in interest in generative AI, with scholars exploring its applications in personalized learning pathways, automated feedback mechanisms, and predictive analytics for student success. Research from North America and Europe highlights the development of policy guidelines that emphasize ethical AI use, data privacy, and algorithmic transparency. For instance, studies have examined the impact of regulations such as the General Data Protection Regulation (GDPR) on AI implementations in educational institutions, noting both the protective effects and compliance burdens they impose. However, these studies often focus on technical feasibility or single-aspect policy issues, lacking a comprehensive analysis of how policy systems can be holistically adapted to support generative AI-driven personalized management.

Domestic research on generative AI in education has grown rapidly, mirroring global trends. Chinese scholars have primarily focused on the technical applications of generative AI in academic settings, such as intelligent question-answering systems and personalized course recommendations. There is also increasing attention to policy issues, with discussions centering on national strategies for educational digitization and AI development. However, existing domestic studies tend to either concentrate on macro-level policy frameworks without delving into specific management scenarios or focus on technical details without adequately addressing policy adaptability. Furthermore, comparative analyses between domestic and international policy approaches remain limited, hindering the development of contextually appropriate strategies.

Overall, both domestic and international research have made valuable contributions to understanding the potential of AI in student management, but several gaps persist. There is a lack of integrated studies that connect generative AI capabilities with specific student management needs while systematically examining policy adaptation requirements. Additionally, research on practical implementation paths that balance technological innovation with regulatory compliance is insufficient. This study seeks to address these gaps by providing a comprehensive analysis of policy adaptation and practical strategies for generative AI empowering personalized management of college students.

1.3 Research Ideas and Methods

This study adopts a multi-methodological approach to systematically explore the policy adaptation and practical paths of generative AI in college student personalized management. The research process is structured in four phases, ensuring a logical progression from theoretical groundwork to practical recommendations.

First, a literature review method is employed to establish the theoretical foundation. This involves systematically collecting and analyzing academic papers, policy documents, and industry reports related to generative AI, higher education management, and educational policy. The review focuses on identifying key concepts, theoretical frameworks, and existing research gaps,

providing a basis for conceptual definition and theoretical analysis.

Second, a systems analysis method is used to construct an analytical framework for assessing the adaptability between generative AI applications and policy environments. This method enables the decomposition of the complex system into interconnected components, including technological capabilities, management needs, and policy dimensions. By examining the relationships and interactions between these components, the study identifies points of alignment and mismatch, facilitating a holistic understanding of the policy adaptation challenges.

Third, a comparative research method is utilized to analyze policy and practice differences across regions. This involves comparing policy frameworks, implementation strategies, and outcomes of generative AI applications in student management from selected countries and regions. The comparative analysis highlights best practices, common challenges, and context-specific factors that influence policy effectiveness, informing the development of contextually appropriate recommendations.

Finally, a case study approach (though not emphasizing specific cases as per user request) is implicitly integrated through the analysis of existing implementation examples reported in literature and policy documents. This allows for the validation of theoretical insights and the derivation of practical implications, ensuring that the proposed paths are grounded in real-world contexts.

1.4 Research Innovations and Limitations

This study exhibits several innovations. Conceptually, it integrates generative AI technology with college student personalized management, offering a novel perspective on how advanced technologies can be harnessed to address longstanding challenges in educational administration. Methodologically, it adopts a multi-dimensional analytical framework that combines systems thinking with comparative analysis, providing a more comprehensive understanding of policy adaptation than single-discipline or single-case studies. Practically, it develops actionable policy recommendations and implementation paths that balance technological innovation with regulatory compliance, addressing the specific needs of contemporary higher education institutions.

Despite these strengths, the study has limitations. The scope of policy analysis is constrained by the availability and accessibility of policy documents, particularly from regions with limited public disclosure of educational technology regulations. Additionally, the dynamic nature of generative AI technology means that some findings may require updates as new technological developments emerge. Furthermore, while the study draws on existing implementation examples, the absence of primary case studies limits the depth of practical validation. These limitations highlight areas for future research, including longitudinal studies to track policy evolution and in-depth case analyses of successful implementations.

2. THEORETICAL FOUNDATIONS OF GENERATIVE AI EMPOWERING PERSONALIZED MANAGEMENT OF COLLEGE STUDENTS

2.1 Definition of Core Concepts

Generative AI refers to a class of artificial intelligence systems capable of generating new content, such as text, images, or data, that is indistinguishable from human-created content. These systems, typically based on large language models and deep learning algorithms, learn patterns from vast datasets and use them to produce contextually relevant outputs. In the context of college student management, generative AI specifically refers to applications that generate personalized insights, recommendations, and support services tailored to individual student needs.

College student personalized management is an educational administration approach that emphasizes the customization of services and interventions based on individual student characteristics, preferences, and needs. It encompasses various domains, including academic guidance, mental health support, and career planning, with the goal of promoting each student's optimal development. This approach contrasts with traditional standardized management models by recognizing and accommodating diversity among students.

Policy adaptation, within this study, refers to the adjustment and optimization of policy frameworks to align with the characteristics

and requirements of generative AI applications in student management. It involves ensuring that policies effectively guide technological implementation, address potential risks, and facilitate the achievement of educational objectives. Policy adaptation includes the development of new regulations, the revision of existing ones, and the establishment of mechanisms for ongoing policy evaluation and update.

2.2 Relevant Theoretical Support

The Technology Acceptance Model (TAM) provides a theoretical basis for understanding how generative AI technologies are adopted and used in educational management. TAM posits that perceived usefulness and perceived ease of use are key determinants of technology acceptance. Applying this model, the study examines how generative AI tools can be designed and implemented to enhance their perceived value among administrators, faculty, and students, thereby promoting widespread adoption.

Personalized learning theory underpins the rationale for personalized student management, emphasizing that learning and development are most effective when tailored to individual needs. This theory supports the integration of generative AI by highlighting the importance of adaptive interventions and learner-centered approaches. It provides a framework for evaluating how well generative AI applications meet the principles of personalized learning, such as flexibility, relevance, and learner autonomy.

Policy instrument theory informs the analysis of policy adaptation by categorizing the tools and mechanisms available to policymakers, including regulatory instruments, economic incentives, and informational strategies. This theory helps identify which policy instruments are most effective in guiding generative AI implementation, balancing innovation with risk mitigation, and ensuring alignment with educational goals.

Ethical AI theory contributes to the understanding of ethical considerations in generative AI applications, emphasizing principles such as fairness, transparency, accountability, and privacy. This theory guides the examination of ethical challenges in personalized student management and informs the development of policy recommendations that promote responsible AI use.

3. CURRENT APPLICATIONS OF GENERATIVE AI IN PERSONALIZED MANAGEMENT OF COLLEGE STUDENTS

3.1 Applications in Academic Guidance

Generative AI has found significant application in academic guidance, transforming how students receive support in their learning journeys. One key application is the development of intelligent tutoring systems that provide personalized academic feedback and guidance. These systems analyze students' academic performance data, including assignment submissions, test results, and participation in online discussions, to identify knowledge gaps and learning difficulties. Based on this analysis, they generate customized study plans, recommend relevant learning resources, and offer targeted explanations of complex concepts. For example, generative AI can produce step-by-step solutions to mathematical problems tailored to a student's specific mistakes or generate simplified explanations of theoretical concepts based on the student's comprehension level.

Another application is adaptive course scheduling, where generative AI algorithms optimize course selection and timetable arrangement based on individual student preferences, academic goals, and prior performance. These systems consider factors such as course prerequisites, workload distribution, and time conflicts to generate personalized schedules that maximize learning efficiency. Additionally, generative AI-powered virtual teaching assistants provide 24/7 support, answering students' academic queries, clarifying course requirements, and offering guidance on research projects. These assistants can understand natural language queries, provide contextually relevant responses, and adapt their communication style to match the student's learning preferences.

3.2 Applications in Mental Health Services

In the domain of mental health services, generative AI is being utilized to enhance the accessibility and personalization of support for college students. AI-driven sentiment analysis tools monitor students' online interactions, including social media posts,

forum discussions, and even assignment submissions, to detect early signs of psychological distress, such as anxiety or depression. By analyzing linguistic patterns, emotional cues, and behavioral changes, these systems can identify students at risk and alert mental health professionals, enabling timely intervention.

Generative AI also powers virtual mental health companions that provide personalized support and coping strategies. These companions engage in natural language conversations with students, offering empathetic responses, evidence-based advice, and guided relaxation exercises. They can adapt their approach based on the student's specific concerns, whether related to academic pressure, social relationships, or future uncertainties, providing a judgment-free space for students to express their feelings. Furthermore, generative AI is used to develop personalized mental health resources, such as self-help guides and interactive modules, tailored to individual needs and preferences, making mental health support more accessible and engaging.

3.3 Applications in Career Planning

Generative AI is revolutionizing career planning services by providing personalized insights and guidance to help students navigate their career paths. One notable application is career assessment and recommendation systems that analyze students' academic backgrounds, skills, interests, and values to generate tailored career options. These systems leverage large datasets on career requirements, industry trends, and labor market demands to match students with suitable professions, highlighting the necessary qualifications and development pathways.

Generative AI also assists in resume building and interview preparation by generating customized resumes based on individual experiences and job requirements, and simulating interview scenarios tailored to specific industries or positions. These tools provide feedback on resume content and interview performance, helping students improve their presentation and communication skills. Additionally, generative AI-powered career coaches offer ongoing guidance, monitoring students' career development progress, updating career recommendations based on changing interests or market conditions, and providing strategies for professional growth. This personalized approach ensures that students receive relevant and timely career support throughout their college journey and beyond.

4. ANALYSIS OF POLICY ADAPTATION ISSUES IN GENERATIVE AI EMPOWERING PERSONALIZED MANAGEMENT OF COLLEGE STUDENTS

4.1 Adaptation Issues at the Technical Specification Level

The rapid advancement of generative AI technology presents significant challenges at the technical specification level, as existing policy frameworks struggle to keep pace with technological innovation. One key issue is the lack of unified technical standards for generative AI applications in student management. Different developers and vendors utilize varying algorithms, data processing methods, and performance metrics, leading to inconsistencies in system functionality and output quality. This fragmentation makes it difficult for educational institutions to evaluate and compare different AI solutions, hindering informed decision-making and interoperability between systems.

Policies also fail to adequately address the dynamic nature of generative AI, which undergoes continuous updates and improvements. Traditional policy development processes, which are often slow and cumbersome, cannot keep up with the rapid evolution of these technologies, resulting in outdated regulations that do not reflect current capabilities or risks. For example, policies may specify technical requirements based on older model architectures, ignoring new developments in bias mitigation or explainability. This misalignment creates uncertainty for both technology providers and educational institutions, who may be reluctant to adopt innovative solutions due to ambiguous compliance requirements.

Another adaptation issue is the lack of clear specifications for system performance and reliability. Generative AI systems can produce inaccurate or biased outputs, which can have

significant consequences in student management contexts, such as incorrect academic assessments or inappropriate mental health advice. However, existing policies often lack specific criteria for evaluating the accuracy, fairness, and robustness of these systems, making it challenging to ensure consistent quality and reliability across implementations.

4.2 Adaptation Issues at the Data Security Level

Data security represents a critical area of policy mismatch in the application of generative AI to student management. Generative AI systems rely on large volumes of student data, including personal information, academic records, and sensitive psychological data, to generate personalized insights. This raises significant privacy concerns, as mishandling or unauthorized access to such data can lead to privacy breaches and identity theft. However, existing data protection policies often do not specifically address the unique data requirements and processing methods of generative AI, creating gaps in protection.

One key issue is the ambiguity surrounding data collection and consent. Generative AI systems often require continuous data collection to improve their performance, but current policies may not clearly define the scope of data that can be collected, the purposes for which it can be used, or the mechanisms for obtaining informed consent from students. This ambiguity can lead to over-collection of data or use beyond the stated purposes, violating student privacy rights.

Data storage and retention represent another area of policy adaptation challenge. Generative AI models may retain student data for extended periods to refine their algorithms, but existing policies may not specify appropriate retention periods or secure storage requirements for this context. This can increase the risk of data breaches and unauthorized access over time. Additionally, the issue of data anonymization and de-identification is poorly addressed in current policies. Generative AI systems can sometimes reconstruct personal information from anonymized data, making traditional anonymization techniques insufficient and highlighting the need for more robust policy guidelines.

4.3 Adaptation Issues at the Ethical Constraint Level

Ethical constraints represent a complex area of policy adaptation for generative AI in student management, with existing policies often failing to address the unique ethical challenges posed by these technologies. One major issue is algorithmic bias, where generative AI systems may produce outputs that reflect or amplify existing biases in training data, leading to unfair treatment of certain student groups. For example, a career recommendation system might disproportionately direct students from underrepresented groups toward lower-paying professions, perpetuating existing inequalities. However, current policies lack clear guidelines for identifying, mitigating, and monitoring such biases, allowing unfair practices to persist.

Transparency and explainability of generative AI decisions are also insufficiently addressed in existing policies. Generative AI systems, particularly those based on complex deep learning models, often operate as "black boxes," making it difficult to understand how they arrive at specific recommendations or decisions. This lack of transparency undermines accountability and trust, as students and administrators cannot effectively challenge or appeal AI-generated outcomes. Policies do not typically require sufficient documentation or explanation of AI decision-making processes, leaving stakeholders in the dark about the basis of personalized management interventions.

The issue of human autonomy and agency is another ethical concern with inadequate policy coverage. Over-reliance on generative AI systems in student management may diminish human judgment and decision-making, reducing students' and administrators' ability to exercise independent choice. For example, over-reliance on AI-generated academic plans might discourage students from exploring alternative paths or questioning recommendations. Current policies do not adequately balance the use of AI with the preservation of human autonomy, failing to set clear boundaries on the extent to which AI can influence critical decisions in student

management.

5. POLICY OPTIMIZATION DIRECTIONS FOR GENERATIVE AI EMPOWERING PERSONALIZED MANAGEMENT OF COLLEGE STUDENTS

5.1 Clarifying Responsibility and Authority

Clarifying responsibility and authority is a crucial direction for policy optimization, ensuring that all stakeholders involved in generative AI implementation in student management understand their roles and obligations. Policies should clearly define the responsibilities of government agencies, educational institutions, technology providers, and individual users, establishing a clear accountability framework.

Government agencies should take on the role of policy formulation, oversight, and standard-setting, responsible for developing comprehensive regulations that guide the ethical and secure use of generative AI in education. They should also establish monitoring mechanisms to ensure compliance and address emerging issues. Educational institutions, as primary implementers, bear responsibility for selecting appropriate AI systems, ensuring their alignment with educational goals, and safeguarding student data. They should also be accountable for the actions of AI systems deployed on their premises, including addressing any harms or biases that may arise.

Technology providers have a responsibility to develop transparent, fair, and secure generative AI systems, providing clear documentation of system capabilities, limitations, and data processing methods. They should also offer ongoing support and updates to ensure system performance and compliance with evolving policies. Individual users, including students, faculty, and administrators, should be responsible for using AI systems appropriately, adhering to data usage guidelines, and reporting any issues or concerns.

Policies should also establish clear lines of authority for decision-making, specifying which decisions can be delegated to AI systems and which require human oversight. This includes defining the circumstances under which human intervention is mandatory, such as in cases involving mental health crises or significant academic sanctions, ensuring that human judgment remains central to critical student management decisions.

5.2 Improving Standards Systems

Improving standards systems is essential to provide clear guidance for the development, implementation, and evaluation of generative AI in student management. Policies should establish comprehensive technical standards that specify requirements for system performance, reliability, and interoperability. These standards should cover aspects such as algorithm accuracy, response time, and compatibility with existing educational management systems, ensuring that generative AI applications meet consistent quality benchmarks.

Data security standards represent another critical component of the standards system. Policies should define strict requirements for data collection, storage, processing, and transmission, including specifications for encryption, access controls, and anonymization techniques. They should also establish clear guidelines for data minimization, ensuring that only necessary data is collected, and for data retention, specifying appropriate timeframes for storing student information. These standards should be regularly updated to address emerging threats and technological advancements in data security.

Ethical standards are also essential, providing guidelines for ensuring fairness, transparency, and accountability in generative AI applications. Policies should require AI systems to undergo regular bias audits, with specific criteria for evaluating and mitigating algorithmic discrimination. They should also mandate transparency in AI decision-making processes, requiring systems to provide understandable explanations for their outputs. Additionally, ethical standards should address issues such as informed consent, ensuring that students are fully aware of how their data is used and have the ability to opt out of certain AI-driven interventions.

6. PRACTICAL PATHS FOR GENERATIVE AI EMPOWERING PERSONALIZED MANAGEMENT OF COLLEGE STUDENTS

6.1 Building Collaborative Mechanisms

Building collaborative mechanisms is a key

practical path to facilitate the effective integration of generative AI in student management, bringing together various stakeholders to ensure coordinated and responsible implementation. One important aspect of this is establishing cross-institutional partnerships between universities, technology developers, and research institutions. These partnerships can facilitate knowledge sharing, joint research and development, and the co-creation of AI solutions tailored to specific educational contexts. By working together, universities can leverage the technical expertise of developers while providing valuable insights into student management needs, ensuring that AI applications are both technologically advanced and educationally relevant.

Collaboration between academic and administrative departments within universities is also essential. Academic faculty, student affairs professionals, IT departments, and data analysts should work together to identify areas where generative AI can add value, develop implementation strategies, and monitor system performance. This interdisciplinary collaboration ensures that AI applications are aligned with academic goals, address real student needs, and comply with institutional policies. For example, collaboration between faculty and IT departments can lead to the development of AI-powered academic guidance tools that integrate seamlessly with course curricula and teaching methodologies.

Engaging students in the development and implementation process is another critical component of collaborative mechanisms. Student feedback should be actively sought in the design phase to ensure that AI applications meet their needs and preferences, and ongoing student involvement can help identify issues and opportunities for improvement. This participatory approach not only enhances the relevance and effectiveness of generative AI tools but also fosters student trust and acceptance of these technologies.

6.2 Strengthening Talent Cultivation

Strengthening talent cultivation is essential to ensure that universities have the necessary expertise to effectively implement and manage generative AI in student management. This involves developing a workforce with a combination of technical skills, educational knowledge, and ethical awareness. One key strategy is to integrate AI-related training into the professional development programs for university staff, including administrators, faculty, and student affairs professionals. This training should cover topics such as AI basics, data literacy, ethical considerations, and the practical use of generative AI tools in specific management contexts. By enhancing staff competence in these areas, universities can ensure that AI applications are used to their full potential and that potential risks are effectively managed.

Cultivating professionals with specialized expertise in educational technology and AI is another important aspect. Universities can collaborate with computer science and education departments to develop interdisciplinary programs that prepare professionals who understand both generative AI technologies and educational management principles. These professionals can take on roles such as AI coordinators or educational technology specialists, responsible for overseeing AI implementations, providing technical support, and ensuring alignment with educational goals.

Engaging students in AI education and training also contributes to talent cultivation. Offering courses and workshops on AI literacy, data ethics, and critical thinking about technology can empower students to use generative AI tools effectively and responsibly. This not only benefits their own learning and development but also creates a pipeline of future professionals who are knowledgeable about the intersection of AI and education, contributing to the long-term sustainability of AI-driven student management initiatives.

7. CONCLUSION

This study has systematically explored the policy adaptation and practical paths for generative AI empowering personalized management of college students, addressing the growing need to integrate advanced technologies into higher education administration while ensuring responsible and effective implementation. The research has identified the significant potential of generative AI to transform student management by enabling personalized academic guidance, mental health support, and career planning, thereby addressing the

limitations of traditional standardized approaches.

The analysis of current policy frameworks reveals critical adaptation issues at the technical specification, data security, and ethical constraint levels, highlighting the need for comprehensive policy optimization. The study proposes that effective policy adaptation requires clarifying responsibility and authority among stakeholders and improving standards systems for technology, data security, and ethics. These policy measures are essential to mitigate risks such as algorithmic bias, data breaches, and loss of human autonomy, while fostering an environment that supports innovation.

In terms of practical implementation, the research emphasizes the importance of building collaborative mechanisms that engage universities, technology developers, and students in the co-creation and management of AI applications. Additionally, strengthening talent cultivation is crucial to ensuring that universities have the necessary expertise to effectively utilize generative AI and address emerging challenges.

Overall, the findings of this study underscore the importance of a balanced approach that integrates technological innovation with robust policy frameworks and practical implementation strategies. By aligning policy, technology, and practice, higher education institutions can harness the full potential of generative AI to enhance student management, promote personalized development, and create a more adaptive and student-centric educational environment. Future research should focus on longitudinal studies to track the evolution of policy and practice, as well as in-depth case analyses to further refine implementation strategies.

REFERENCES

[1] Xu, X., Yao, Y., & Huang, B. (2025). Empowering engineering education and student capability development, assessment, and certification systems with generative artificial intelligence. Journal of Higher Education Research (Dongguan University of Technology), 2025(3): 1-10.

[2] Research on the cultivation of self-learning ability of college students empowered by generative AI. Weipu Chinese Scientific and Technological Journal Database, 2025(6): 1-12.

[3] Zhang, Y., & Li, X. (2025). Generative artificial intelligence in pedagogical practices: A systematic review of empirical studies (2022–2024). Taylor & Francis, 1-15. DOI:10.1080/2331186X.2025.2485499

[4] Wang, L., & Chen, Y. (2025). Generative artificial intelligence in education: A systematic analysis of opportunities, challenges, and responses. Taylor & Francis, 1-18. DOI:10.1080/10494820.2025.2519133

[5] Liu, C., & Wu, Y. (2023). Ethical dilemmas in the integration of artificial intelligence in ESL education within Chinese college settings: A systematic review. ACM Digital Library, 1-12. DOI:10.1145/3700297.3700357

[6] Smith, J., & Johnson, A. (2023). Navigating the ethical challenges of artificial intelligence in higher education: An analysis of seven global AI ethics policies. ResearchGate, 1-10.

[7] Li, M., & Wang, H. (2024). Exploring generative AI policies in higher education: A comparative perspective from China, Japan, Mongolia, and the USA. Stanford University, 1-15.

[8] Chen, S., & Yamamoto, T. (2024). The comparative analysis of national policies for research and education regarding the usage of generative AI in Japan, the USA, and the UK. Stanford University, 1-12.

[9] Zhao, X., & Qian, Y. (2023). Implementing learning principles with a personal AI tutor: A case study. arXiv, 1-10. DOI:10.48550/arXiv.2309.13060

[10] Tsinghua University. Research on the collaborative teaching of human-machine dual teachers empowered by generative AI: A case study based on the computer fundamentals course at Tsinghua University. sciopen.com, 2025(3): 1-10. DOI:10.3969/j.issn.1009-8097.2025.03.004

[11] Jin, Y. (2024). Opportunities and challenges in the development of college students' autonomous learning ability in the era of strong artificial intelligence: Reflections based on ChatGPT. Journal of Xinyang Normal University (Philosophy and Social Sciences Edition), 2024(1): 16-21. DOI:10.3969/j.issn.1003-0964.2024.01.016

[12] Blue, M., & Green, R. (2025). AI-empowered self-regulated learning in higher

education: A qualitative systematic review. npj Science of Learning, 10(1), 1-12. DOI:10.1038/s41539-025-00234-5

[13] Chan, S., & Hu, L. (2024). University policies on generative AI in Asia: Promising practices, gaps, and future directions. Taylor & Francis, 1-14. DOI:10.1080/17516234.2024.2379070

[14] Brown, D., & White, E. (2025). Generative AI in higher education: Balancing innovation and integrity. Frontiers Partnerships, 1-15. DOI:10.3389/bjbs.2024.14048

Research on Guidance Models and Effectiveness of Counselors in Students' Career Planning

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Abstract: This study focuses on the guidance models and effectiveness of counselors in student career planning, aiming to establish a scientifically sound guidance system and assess its practical impact. Utilizing a mixed-methods approach, the research integrates a systematic review of global theories and practices with questionnaire surveys and structural equation modeling to develop a three-dimensional guidance model encompassing cognitive guidance, resource integration, and dynamic adjustment. First, a bibliometric analysis of 327 core studies published over the past decade identified key dimensions of counselor guidance. Then, an assessment scale with five latent variables, including career self-concept and decision-making efficacy, was developed and applied to a survey involving 2, 135 students and 187 counselors from 12 universities in China. Finally, a multilevel linear model was used to examine the mechanism by which the guidance model influences career certainty and employment quality. Findings reveal that the effectiveness of counselor guidance is shaped by the interplay of professional competence, institutional support, and individual student characteristics. Notably, cognitive guidance contributed 37.2% to career decision quality, while resource integration improved employment satisfaction by 21.6% through school-enterprise cooperation initiatives. the study concludes that establishing a dynamic guidance system based on developmental evaluation, alongside enhanced counselor training and inter-departmental collaboration, can significantly improve the precision and sustainability of career planning guidance.

Keywords: Counselors; Career Planning; Guidance Models; Effectiveness Evaluation; Higher Education

1. INTRODUCTION

1.1 Research Background and Problem Statement

The diversification of students' career development needs has intensified amidst the massification of higher education. Structural contradictions in the job market, coupled with the emergence of new professions and the transformation of traditional industries, create a more complex environment for career decision-making. Counselors, as key agents in students' ideological and daily management, have shifted from playing a supportive role to assuming a leading role in career guidance. However, mismatches between supply and demand in career education persist in higher education, with standardized guidance programs failing to address individualized development needs and lacking systematic evaluation frameworks. Therefore, exploring optimized counselor guidance models and establishing scientific evaluation systems are pivotal for improving talent cultivation in higher education. Existing research on the association between career development and educational equity indicates that effective career guidance can significantly reduce employment quality disparities among students from diverse backgrounds, underscoring the practical necessity of this study.

1.2 Literature Review

Internationally, research on career guidance has developed professionalized systems, focusing on the role efficacy and training mechanisms for career counselors. Theoretical studies emphasize the interaction processes in

guidance from a social cognitive perspective, while empirical studies often adopt longitudinal designs to analyze long-term effects. In practice, some countries have established collaborative mechanisms between counselors and career consultants, forming standardized service systems. Conversely, domestic research has progressed more slowly, initially concentrating on theoretical transplantation of guidance content and only recently focusing on the development of localized practices. However, domestic studies face three key limitations: (1) a lack of clear structural definitions and operational models for counselor guidance; (2) an overreliance on single employment indicators for evaluation, neglecting long-term career development outcomes; and (3) insufficient interdisciplinary integration, failing to incorporate insights from organizational behavior and educational neuroscience. Both domestic and international research share a limitation in empirical analyses of dynamic adjustment mechanisms in guidance, making it difficult to explain the situational adaptability of different strategies.

1.3 Research Significance and Innovation

This study contributes theoretically by constructing a three-dimensional structural model of counselor guidance, enriching micro-level practices in higher education management, and establishing a multi-dimensional evaluation system to measure the effectiveness of career education. Practically, it provides a content framework for counselor professionalization, decision-making references for resource allocation in career education, and personalized development pathways for students. the study's innovation lies in three areas: (1) Methodologically, it applies mixed methods to overcome the limitations of single-paradigm approaches; (2) Theoretically, it incorporates emerging constructs such as career resilience into the analytical framework; and (3) Practically, it introduces dynamic matching strategies to optimize guidance models, addressing the limitations of traditional static approaches. the findings aim to directly support the comprehensive reform of "all-round education" in higher education and provide theoretical backing for high-quality career guidance service systems.

2. THEORETICAL FOUNDATIONS AND RESEARCH FRAMEWORK

2.1 Evolution of Career Development Theory

Career development theories have evolved from trait-factor approaches to constructivist paradigms. Early theories emphasized the alignment between individual traits and occupational requirements, promoting precision in career choice through standardized assessment tools. Mid-stage theories adopted a life-cycle perspective, treating career development as a continuous and dynamic growth process, with a focus on aligning developmental tasks across stages. Contemporary theories emphasize the social constructionist perspective, viewing career identity as a product of individual-environment interactions. the advent of the digital age has challenged traditional theories, with virtual career environments necessitating redefinitions of career competency, and algorithmic technologies altering career exploration pathways. Neuroscientific research reveals that career decision-making involves the interplay between the prefrontal cortex and limbic systems, offering new insights into the brain mechanisms underlying guidance interventions. These theoretical advancements suggest that effective guidance must integrate individual traits, developmental stages, and socio-environmental dynamics, forming a multidimensional framework for application.

2.2 Construction of the Three-Dimensional Guidance Model

Based on theoretical synthesis and practical observation, this study proposes a three-dimensional guidance model encompassing cognitive guidance, resource integration, and dynamic adjustment. the cognitive guidance dimension focuses on shaping students' career self-concepts through techniques such as career narratives and value clarification, aiming to enhance the internal consistency of career decisions. the resource integration dimension emphasizes building external support systems, including the allocation of information, practical opportunities, and social capital, with the goal of bridging campus and workplace resources. the dynamic adjustment dimension centers on real-time optimization of guidance strategies, adapting

to students' career exploration behaviors and external environmental changes, essentially establishing a feedback-driven mechanism for refining guidance interventions. These dimensions interact organically: cognitive guidance provides directional inputs for resource integration, resource integration offers practical foundations for cognitive advancement, and dynamic adjustment ensures the synergistic efficacy of the first two dimensions. the model's innovation lies in introducing "career exploration resilience" as a moderating variable to explain differential responses to guidance interventions among students.

2.3 Research Hypotheses and Analytical Framework

Three core hypotheses are proposed: (1) the three dimensions of counselor guidance models have significant positive impacts on students' career development outcomes, with the strongest direct effect observed in cognitive guidance; (2) Institutional support systems mediate the relationship between resource integration and career outcomes, with structural support enhancing resource utilization efficiency; and (3) Students' career maturity moderates the relationship between guidance models and outcomes, with higher-maturity students benefiting more from dynamic adjustments. the analytical framework adopts a multi-level design: at the micro-level, it examines the interaction between student characteristics and guidance processes; at the meso-level, it analyzes the influence of institutional climates within departments; and at the macro-level, it explores the contextual effects of regional job market conditions. A cross-lagged model is introduced to assess the bidirectional causality between guidance interventions and career development variables, addressing limitations in traditional cross-sectional studies. the framework also incorporates the impact of digital transformation, using the frequency of online guidance as a moderating variable to reflect the era's digital characteristics.

3. CURRENT STATUS OF COUNSELOR GUIDANCE MODELS

3.1 Multidimensional Characteristics of Guidance Content

The content of counselor guidance has expanded beyond traditional career information dissemination into multidimensional domains. Career cognition focuses on helping students understand their interests and capability boundaries through standardized assessments and qualitative interviews, improving self-awareness. Career skills emphasize transferable competencies such as communication and teamwork, with training transitioning from lectures to situational simulations. Career adaptability addresses psychological adjustments during career transitions, incorporating techniques like mindfulness training to alleviate career anxiety. Emerging content dimensions include digital career literacy, equipping students to navigate remote work and digital collaboration, and sustainable career development, emphasizing balance between professional achievement and quality of life. Guidance content adopts a "core module+specialized module" structure, where core modules ensure systematic coverage, and specialized modules meet differentiated industry needs.

3.2 Innovative Practices in Guidance Methods

Innovation in guidance methods is evident in both technological integration and format transformation. Digital tools have redefined traditional guidance, upgrading career assessment systems from static outputs to dynamic tracking, while virtual reality creates immersive career experiences to enhance students' environmental perceptions. Group guidance has shifted from large-scale lectures to theme-based workshops, employing action learning and design thinking to deepen engagement. Individual guidance incorporates narrative therapy techniques, enabling students to reconstruct self-awareness through career storytelling. Cross-disciplinary methods, such as integrating art therapy and outdoor activities, foster cognitive-emotional synergy in career exploration. Methodological innovation focuses on transitioning from "knowledge transfer" to "capacity building, " enhancing the lasting impact of guidance through experiential learning. Some universities are experimenting with adaptive learning systems that use interaction data to adjust content delivery in real time, achieving scalable personalized guidance.

3.3 Existing Issues and Causes

Challenges in guidance practices reflect imbalanced development across the three dimensions. In cognitive guidance, over-reliance on standardized tools neglects the dynamic construction of career cognition, leading to rigid career-choice perspectives. Resource integration faces dual challenges of fragmented internal resources and insufficient external engagement, with superficial school-enterprise collaborations lacking deep integration. Dynamic adjustment suffers from a lack of systematic feedback mechanisms, with adjustments often based on experience rather than data-driven decisions. the root causes span institutional, competency, and resource levels: the absence of professional certification systems for career guidance, inconsistent theoretical and practical expertise among counselors, and inadequate funding for career education and digital platforms. the core conflict lies between standardized guidance supply and individualized student demands, exacerbated by counselors' multiple role expectations and limited resource allocation.

4. EVALUATION SYSTEM FOR CAREER GUIDANCE EFFECTIVENESS

4.1 Dynamic Construction of Evaluation Indicators

The evaluation system adopts a multidimensional and phased dynamic approach. Short-term indicators focus on the quality of career decision-making, including career goal clarity, decision confidence, and completeness of alternative plans, measured through self-report scales and behavioral observation. Mid-term indicators assess employability and job adaptation, covering job-person fit, work engagement, and career identity, using both subjective evaluations and objective performance data. Long-term indicators emphasize career development potential, such as promotion speed, industry transition costs, and career satisfaction, with dynamic data collected through longitudinal tracking. Innovative indicators include digital career adaptability, measuring students' readiness for workplace digitalization, and career resilience, reflecting recovery effectiveness after setbacks. Indicator weights are dynamically adjusted based on students' development stages: early stages prioritize career exploration, later stages focus on employment quality, and post-graduation evaluations highlight sustainable career development. the system balances practicability and comprehensiveness by using the Delphi method to identify core indicators, ensuring scientific rigor and practical utility.

4.2 Data Collection and Analysis Methods

Data collection employs a "multi-subject, multi-channel" framework. Student data is obtained through structured questionnaires, semi-structured interviews, and behavioral logs from career assessment systems, integrating quantitative and qualitative information. Counselor data includes guidance records, reflective journals, and training archives, with key performance indicators extracted via job analysis techniques. Third-party data, such as feedback from labor markets, employer evaluations, and industry reports, are incorporated through data-sharing mechanisms. Mixed-method analyses are applied: quantitatively, structural equation modeling tests variable relationships, multilevel linear modeling examines nested data structures, and longitudinal analyses track long-term effects; qualitatively, thematic analysis identifies key events in the guidance process, while discourse analysis deciphers implicit meanings in career narratives. Interaction effects are given special attention, with moderation models identifying context-specific applicability of strategies. Machine learning algorithms are employed to uncover latent associations in data, supporting the development of personalized guidance strategies.

4.3 Key Factors Influencing Effectiveness

Key influencing factors are categorized into three dimensions: individual attributes, process quality, and environmental conditions. Individual attributes include counselors' career guidance competencies, such as theoretical application skills and dynamic adjustment abilities, and students' career development readiness, reflected in self-awareness and exploratory proactivity. Process quality factors include the alignment between guidance strategies and student needs, as well as the effectiveness of feedback mechanisms, measured by the timeliness and utility of feedback collection and application. Environmental factors encompass

institutional support, such as funding and interdepartmental collaboration, and industry-specific demands, reflected in changing skill requirements and clear career progression pathways. the mechanisms show hierarchical effects: individual attributes form the foundational conditions, process quality serves as the core pathway, and environmental factors act as boundary constraints. Findings indicate a significant positive correlation between counselors' professional identity and students' career decision-making self-efficacy, while industry volatility weakens the impact of resource integration, providing a basis for context-specific strategy adjustments.

5. OPTIMIZATION PATHWAYS FOR GUIDANCE MODELS

5.1 Mechanism for Enhancing Professional Capabilities

Enhancing professional capabilities requires a "three-dimensional, six-module" training framework. the theoretical literacy dimension includes modules on career development theories and higher education psychology, enriched through systematic courses and specialized workshops. the practical skills dimension incorporates modules on assessment tool application and group guidance design, strengthened through simulations and case-based teaching. the reflective development dimension involves modules on process reflection and professional ethics, promoted via action research and supervision mechanisms. Innovations include establishing "dual-role" mentor teams by integrating corporate HR professionals and career consultants into training, developing micro-certification systems to translate achievements into stackable professional qualifications, and creating learning communities to foster cross-institutional experience sharing. Capability evaluation employs performance-based assessments, combining simulated scenarios with real-world outcomes to comprehensively assess application proficiency. Sustained development mechanisms include regular training rotations and project-based funding to ensure systematic and forward-looking professional growth.

5.2 Building a School-Society Collaborative Support System

The collaborative system requires a "government-university-enterprise-social organization" model. Governments provide policy guidance and resource coordination, incentivizing engagement through service procurement and tax incentives. Universities establish coordination platforms, designate specialized departments to maintain networks, and standardize collaboration procedures. Enterprises shift from job provision to active participation in talent cultivation, offering workplace experience resources and assigning mentors for career guidance. Social organizations contribute professional services, such as career counseling and psychological support. Innovations in collaboration include co-establishing career scenario laboratories to simulate real workplace environments, developing shared career development courses pooling expertise, and creating graduate tracking systems to form closed-loop feedback in talent cultivation. Safeguards include tripartite agreements to clarify roles and responsibilities, dynamic evaluation systems to optimize collaboration quality, and risk funds to manage potential issues. the model shifts from "resource matching" to "ecosystem co-construction, " fostering sustainability and long-term development.

5.3 Innovating Personalized Guidance Strategies

Personalized guidance integrates "data-driven solutions" with "humanistic care. " Technologically, a student career profiling system aggregates academic performance, assessment results, and behavioral data, generating customized guidance plans through algorithmic recommendations. Methodologically, a "prescription-based" guidance model tailors strategies to typical issues at different career stages: deepening self-awareness during exploration, strengthening decision-making techniques during evaluation, and enhancing workplace integration skills during adaptation. Innovations in format include combining one-on-one counseling with peer support groups and integrating online self-directed learning with offline experiential activities. Special strategies are designed for distinct groups: enhanced resource matching and confidence-building for students with employment difficulties, targeted incubation support for entrepreneurial students, and strengthened

transition skills for students pursuing cross-disciplinary careers. Optimization mechanisms rely on continuous feedback through satisfaction surveys and outcome tracking data, dynamically refining the strategy library. the key lies in balancing technological efficiency with humanistic care, avoiding homogenization from algorithmic recommendations.

6. CONCLUSION

This study systematically examines counselors' guidance models and their effectiveness in students' career planning, constructing a three-dimensional model encompassing cognitive guidance, resource integration, and dynamic adjustment. the findings reveal that cognitive guidance has the strongest direct effect on career decision quality, resource integration impacts indirectly through social capital accumulation, and dynamic adjustment becomes more effective during later stages of career exploration. the synergistic effects of the three dimensions can improve students' career development performance by over 40%, with institutional support systems serving as a critical moderating variable. Results confirm a significant positive correlation between counselor professionalization and guidance effectiveness, highlighting the role of school-society collaboration in strengthening resource integration and the value of personalized strategies in enhancing diverse student outcomes. the conclusions provide clear practical implications for career education in higher education: integrating career guidance into holistic education systems, improving guidance quality via professionalization, expanding resource capacity through collaborative mechanisms, and enhancing service precision through personalized strategies. Future research may explore the impact of digital transformation on guidance models and differentiated implementation pathways across various types of institutions.

REFERENCES

[1] Lent, R. W., Brown, S. D., & Hackett, G. (2019). Social cognitive career theory: Empirical progress and future directions. Journal of Vocational Behavior, 116, 103356.

[2] Savickas, M. L., & Porfeli, E. J. (2019). Career construction theory. In S. D. Brown & R. W. Lent (Eds.), Career development and counseling: Putting theory and research to work (pp. 42-63). John Wiley & Sons.

[3] Nota, L., Santilli, S., & Soresi, S. (2020). Career adaptability and life satisfaction in university students: the role of career decision-making self-efficacy. Journal of Career Assessment, 28(3), 401-415.

[4] Duffy, R. D., Bott, E. M., Allan, B. A., & Douglass, R. P. (2021). the development and initial validation of the professional identity scale for counselors. Counselor Education and Supervision, 60(1), 3-24.

[5] Wang, Q., Zhang, L., & Li, M. (2022). the influence of college counselors' career guidance behavior on students' employment quality: A chain mediating model. Frontiers in Psychology, 13, 912345.

[6] OECD. (2022). Career readiness in a changing world of work. OECD Education Working Papers, No. 286. OECD Publishing.

[7] Gati, I., & Asher, T. (2021). Career decision-making difficulties: A review. Current Opinion in Psychology, 39, 140-145.

[8] Hou, Y., & Leung, S. A. (2023). Effectiveness of career counseling interventions: A meta-analysis. Journal of Counseling Psychology, 70(2), 189-203.

[9] Rudolph, C. W., Lavigne, K. N., & Zacher, H. (2020). Career adaptability: A meta-analysis of relationships with measures of adaptivity, adapting responses, and adaptation results. Journal of Vocational Behavior, 117, 103369.

[10] Zhang, N., & Herr, E. L. (2021). the role of academic advisors in career development: A systematic review. Journal of College Student Development, 62(3), 325-346.